DECEMBER 1949

Plant Engineering

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Volume 3, No. 12

The magazine that helps plant engineers with their everyday problems

You never saw a pipe threader quite like the

NEW BEAVER 26-R

the ONLY fully adjustable line of threaders

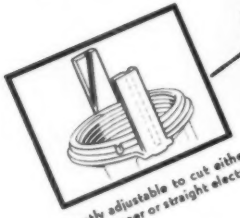
The new Beaver 26-R is a great advancement over the "old No. 26" . . . the original 1 to 2-inch self-contained fully-adjustable pipe threader—which has been popular all over the world for the past 40 years.

The new Beaver 26-R threads 1, 1¼, 1½ and 2-inch pipe with only one set of dies—now ground to cut far easier than ever before. A self-centering chuck insures perfect alignment—and straight pipe lines—yet "drip threads" may be easily cut when desired. Also, the Beaver 26-R is the only tool which can be instantly adjusted to cut either standard taper or straight electric conduit threads. It is the only "fully-adjustable" tool which will cut standard, oversize or undersize threads of uniform length, insuring better joints and stronger pipe lines.

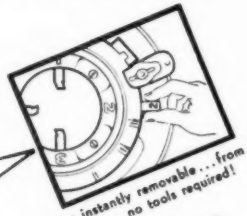
New Beaver 26-R will last longer—cost less to maintain—yield better work—and, what is most important, your men will like to use it better. We earnestly invite you to try the new Beaver 26-R in competition with any tool you are now using. Available through all legitimate supply houses . . . anywhere!

Write today for Catalog No. 48 with full information.

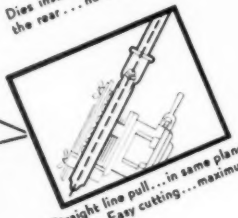
Radio Dial . . . visible, easy, accurate die setting mechanism. A Beaver exclusive.



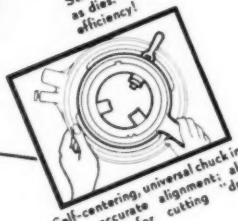
Instantly adjustable to cut either standard taper or straight electric conduit threads.



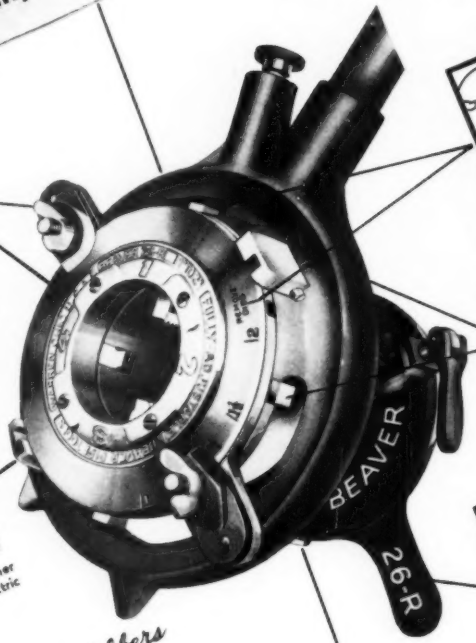
Dies instantly removable . . . from the rear . . . no tools required!



Straight line pull . . . in same plane as dies. Easy cutting . . . maximum efficiency!



Self-centering, universal chuck insures accurate alignment; also adjustable for cutting "drip" threads!



49 Years of Friendly Service to Jobbers

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This hose resists water absorption—lasts up to 100% longer

"Wet strength" cord adds years of life to B.F. Goodrich water hose

B. F. GOODRICH water hose is made with rubber compounds that make it highly resistant to water absorption, swelling, carcass damage.

In accelerated laboratory tests B. F. Goodrich water hose absorbed less than half as much water as other brands tested. This means longer hose life, because water can diffuse through to the carcass to cause mildew and mold.

All types of B. F. Goodrich water hose have this longer-lived compound. And all types have "wet strength" cord —specially treated long-staple cotton that actually becomes *stronger* when wetted (where synthetic fibers weaken).

Tubes—All grades and types of B. F. Goodrich water hose are fortified with Agerite, the chemical that makes rubber last longer. Most BFG water hose stands hot water; some—creamery hose for example—even take low pressure steam. Specially compounded tubes available to stand water contaminated with acids and other chemicals.

Covers—You can drag B. F. Goodrich water hose over wet concrete floors, dirt and cinder yards, use it on highways where it gets run over. It's compounded to take severe abrasion, to resist cutting and gouging. Some covers are compounded to stand oils and greases. Can be made with rubber-capped ends, that protect the carcass from moisture wicking in. Built-in nozzles and tapered ends can be dropped anywhere without doing damage.

If you use water hose don't be satisfied without knowing what developments BFG may have made in hose for your particular type of service. To make sure you get the longest life from water hose, see your local BFG distributor. *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Water Hose BY
B.F. Goodrich

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ABC

'Round About with the Editors

Drop Around At The Maintenance Show

DON'T FORGET to drop in and meet the PLANT ENGINEERING staff when you are visiting the Plant Maintenance Show in Cleveland, January 16 through 19. We'll all be at Booth 201 and if anyone has gripes or bouquets, or even tired feet, they are invited to park them until relieved.

From all advance billings it is going to be a good place to see what's been happening product-wise and the technical sessions should be filled with meat. Topics for the four-day conference include maintenance management principles; maintenance cost; light equipment; upkeep of motors, controls, distribution equipment, floors, walls and roofs; use of electrical instruments in maintenance; relationship of color and light to production; sanitation; lubrication; use of service equipment, and personnel safety.

You Just Never Know

NEXT TO A job in plant engineering departments, we'll vote for an editorial job as being the most filled with surprises and unlooked-for occurrences.

In the October issue we published an article on rigging; one of the illustrations taken from the author's scrap book, showed a large turbine runner which had been hoisted into position by means of a pair of shears. It was used only as an example of the type of work which could be done with temporary elevating machinery.

Nevertheless, we have just recevied a request from the PE in a large paper company wanting to know who made the turbine runner! After some detective work we found it had been made many years ago by the firm of Wellman-Seaver-Morgan of Akron. This company is now Wellman Engineering Co. of Cleveland.

From the Argentine Comes Greetings

WE ARE PLEASED to advise that we have published in the June edition of our magazine "Ingenieria e Industria" the article titled in Spanish "Costo de la Calefaccion Electrica en los Edificios Industriales," by Mr. W. G. Davies, Jr., which we have translated from PLANT ENGINEERING. (Electric Heating Costs in Industry, page 42, November 1948). Thank you very much for your fine cooperation. *R. C. Montaldo, Technical Director, Buenos Aires.*

Plant Engineers Advance at B. F. Goodrich

SEVERAL CHANGES have been made recently in the executive staff of The B. F. Goodrich Co.'s engineering division, following the assignment of **H. E. Cook,** Chief Engineer for many years, to major engineering problems including direction of design and construction and corporate-wide utility, power and coal company property policy.

Frank Brown has been appointed plant engineer of all Akron plants and **George Murphy,** plant engineer at Plant 4, reporting to Mr. Brown. **Clifford R. Augden,** named superintendent of shops, also reports to Mr. Brown.

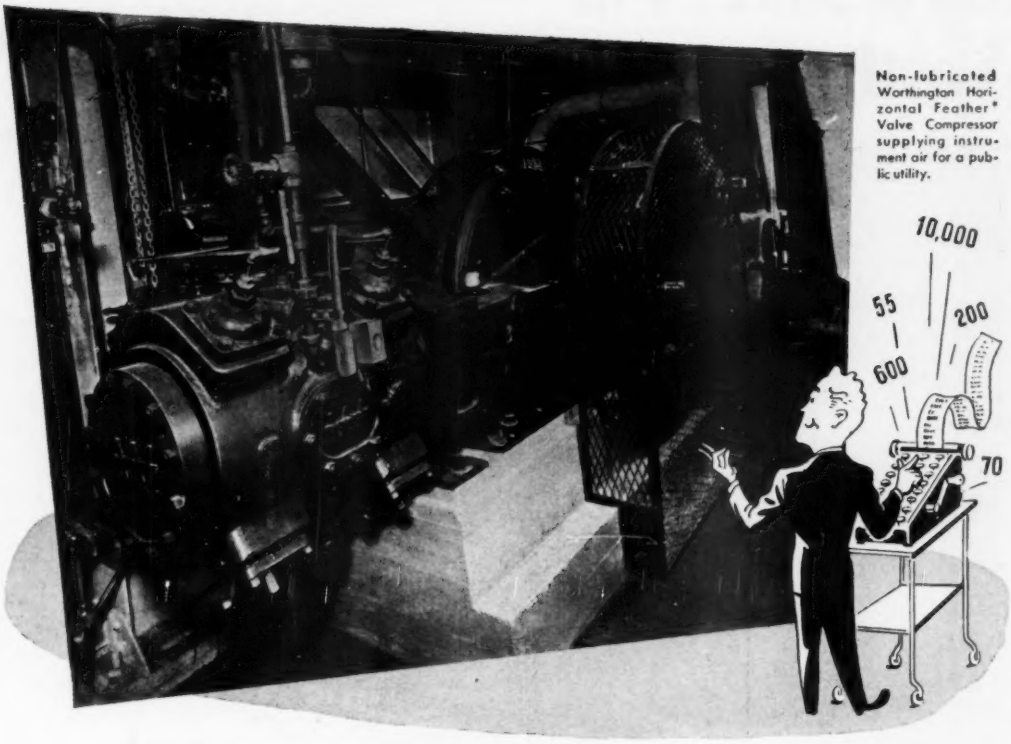
Mr. Brown is a graduate engineer from the University of Michigan and has been with the company since 1927. He started as a power engineer, was technical superintendent of the metal products division and goes to his new job after serving as superintendent of shops.

Mr. Murphy studied engineering at Carnegie Tech and John Huntington Polytechnic Institute and began as a factory employee in 1933. He has been a construction engineer and a general foreman of engineering for three years before his present assignment.

Mr. Augden, who succeeds Mr. Brown as superintendent of shops, received his bachelor's degree in metallurgical engineering from Case, and his master's degree from Ohio State. He has been with the company for 16 years, serving as metallurgist and metal shops general foreman.

Prexy Reads It, Too!

Jack C. Stewart, Plant Superintendent, Jesco Lubricants Co., North Kansas City, Mo., recently wrote to tell us that "Your magazine, PLANT ENGINEERING, is one of the most interesting and helpful I have ever read. I look forward to each issue which is passed on to me after Mr. Johnson, the president of our company, reads them. He is equally enthusiastic about it."



Non-lubricated Worthington Horizontal Feather* Valve Compressor supplying instrument air for a public utility.

Piston Displacement

UP TO 1,044,367,200 C. F. Y.

(1,047,228,480 Cu. Ft. Each Leap Year)

Maybe it's a bit on the optimistic side to claim that a Worthington Single Horizontal Compressor, Type HB, will keep going 24 hours a day, 365 days a year. But, the more you look into this line of 29 rugged machines (ranging in size from 5" x 5" to 26" x 13"), the more clearly you'll see that everything about them adds up to continuous, heavy-duty operation . . . year after year.

WRITE FOR BULLETIN L-640-B1A

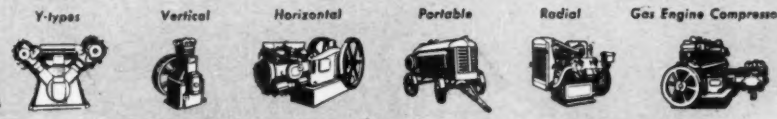
If getting low-cost air is your responsibility, you'll want to look into the 24 pages of this bulletin. Write for it today and learn why — in compressors, as in so much other equipment — *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Compressor Division, Buffalo, New York.*

*Reg. U.S. Pat. Off.

WORTHINGTON

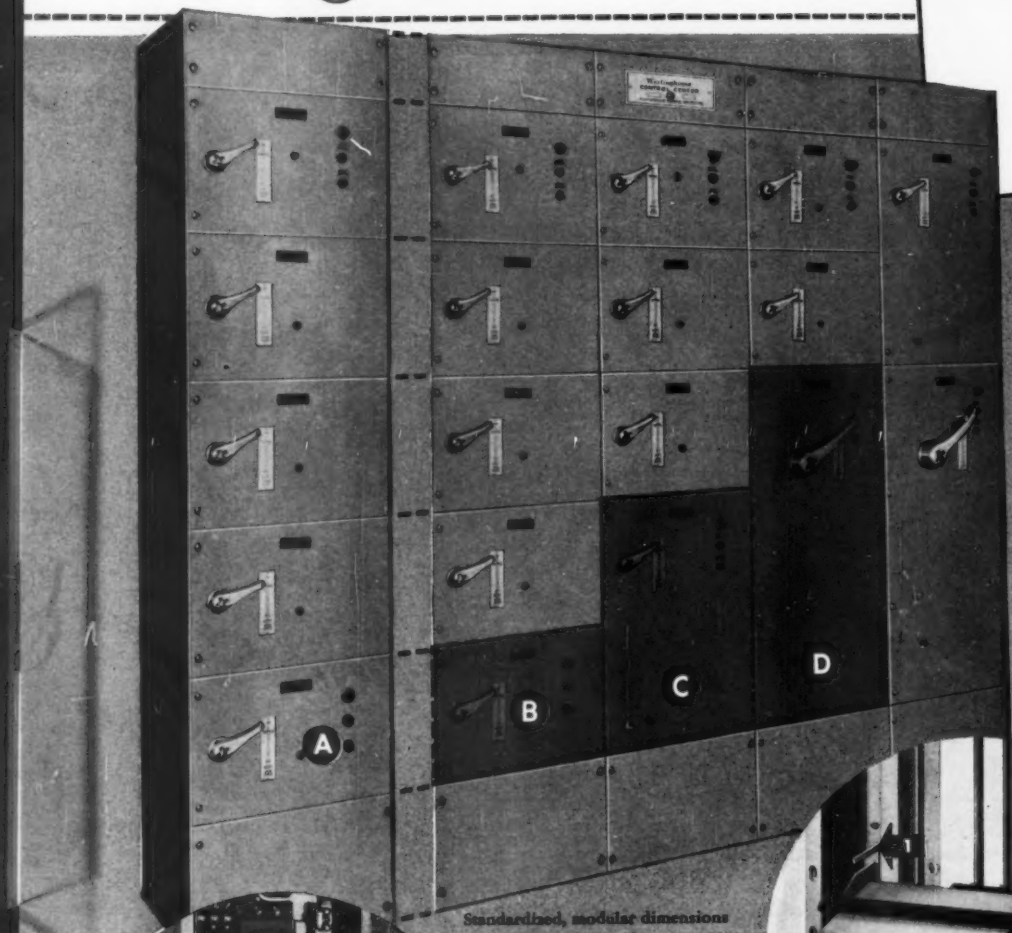
K7 6

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON

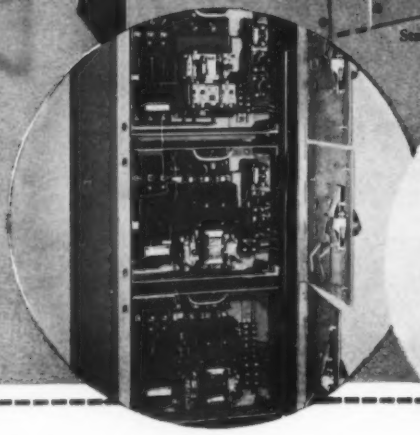


YOU CAN BE **SURE**.. IF IT'S

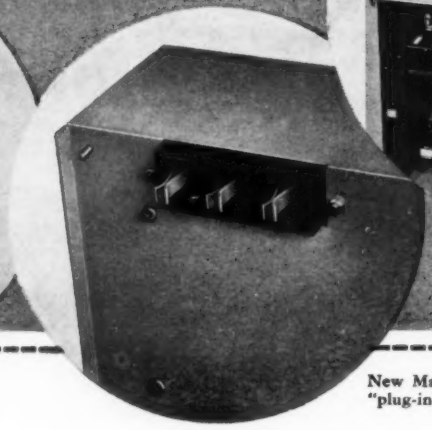
Westinghouse



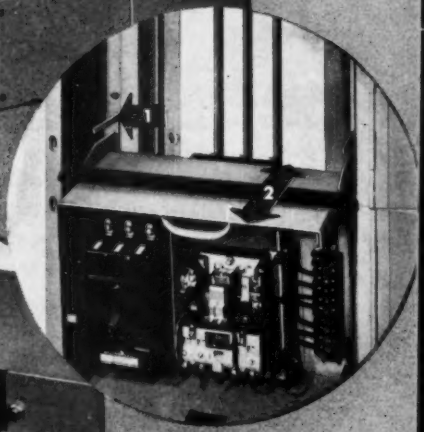
Standardized, modular dimensions



Large, vertical wiring trough



New Magna-Grip connectors for "plug-in" safety and convenience.



1. Guide rails assure perfect alignment of stabs
2. "Tilt-out" disconnect position

... the greatest advancement in "PLUG IN" control center design

The *NEW* Westinghouse CONTROL CENTER

Unusual operating benefits—advantages never before offered by centralized motor control equipment—are yours in the new Westinghouse Control Center. Credit them to this matchless combination of design features:

"TILT POSITION" DISCONNECT . . . for unmatched safety! Interlocking handles prevent opening of starter doors unless the breaker is in the "off" position. The starter may then be withdrawn to a self-supporting "tilt position" which disconnects it from the power bus. This means double protection for the operator!

NEW, MAGNA-GRIP "PLUG-IN" CONNECTORS . . . for unmatched operating simplicity! Magna-Grip "plug-in" connectors of high-quality, silver plated, alloy copper retains spring pressure even under extreme temperature conditions . . . combine safety with convenience in starter unit removal or replacement. They simply "plug-in" to the power bus to eliminate the danger attached to working on "hot" lines. Foolproof guide rails assure perfect alignment.

A CONTINUOUS VERTICAL WIRING TROUGH . . . for unmatched wiring convenience! Easily removable side baffles and support bars create a continuous wiring trough—unobstructed from top to bottom—to permit an easier, faster wiring job.

STANDARDIZED, MODULAR DIMENSIONS . . . for unmatched flexibility; vertical structures (A) of standard width and depth are 76″ or 90″ in height. Starter units (B, C, D) are 14″ high or in multiples of 14″. This modular design permits many combinations of starter units in single vertical structures . . . provides for simple interchangeability between large and small starter units.

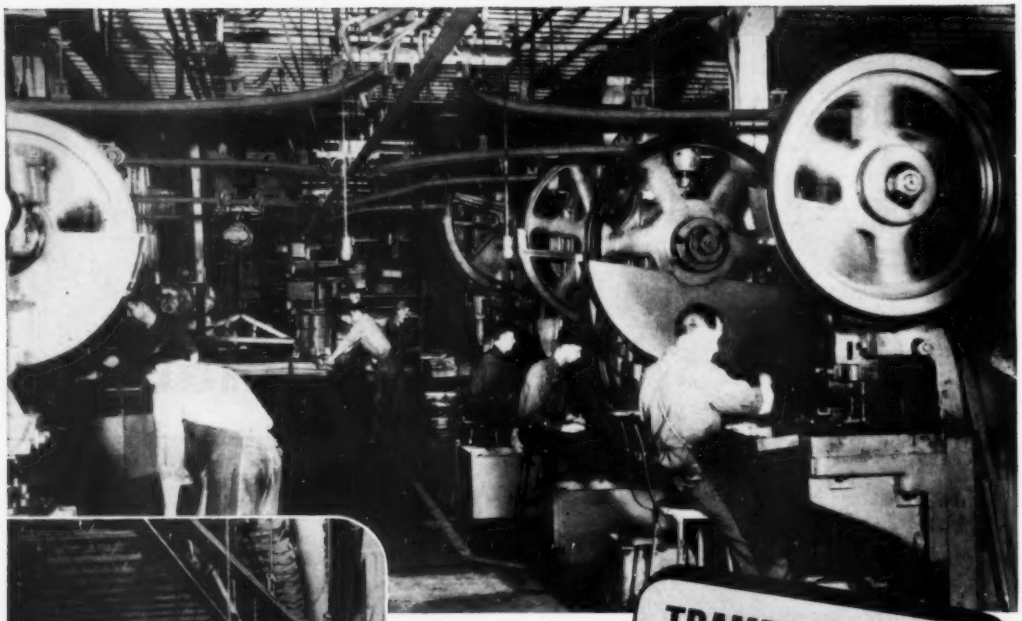
The remarkable features of this new control center are the products of the same skillful engineering that has pioneered many major developments in centralized motor control equipment. It's another sound foundation for *sureness* when you specify Westinghouse. J-21538

GET THE COMPLETE STORY

Complete information on the new Westinghouse Control Center is contained in Booklet B-4213 just off the press. Ask your Westinghouse representative for a copy, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

Westinghouse

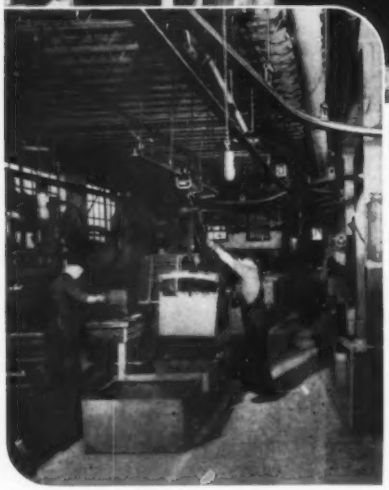
CONTROL CENTERS



This illustrates the extreme flexibility of Cleveland Tramrail. This rail system is so laid out that hand-operated hoist carriers can deliver materials from any press to any other press without intermediate handling.

Courtesy United States Register Co., Battle Creek, Mich.

TRAMRAIL SERVES EVERY PRESS at United States Register Company



Boxes of materials are easily picked up and transported. If desired, this type of Cleveland Tramrail system can be electrified and the heavy lifting done with motor-driven hoists.

75% REDUCTION IN TIME FOR DIE CHANGES — NO HANDLING ACCIDENTS SINCE INSTALLED IN 1938 . . .

An inexpensive, easily-installed, hand-propelled Cleveland Tramrail system interconnects all presses with each other and also connects each with the die storage and machine shop. All but 18 small presses are served this way.

Hand and motor driven hoists are used in making die changes and servicing the presses with raw stock. Dies up to one ton are handled without difficulty and with 75% reduction in time over hoists formerly used.

No accidents in the handling of dies and materials have occurred since this system was installed in 1938.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
7549 EAST 284th St. WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

How Darling features prevent trouble and expense

*This advertisement is one of a series showing how the unique Darling Fully Revolving Double Disc Parallel Seat Gate Valves answer the following critical operating problems:

- Positive, easy closing—regardless.
- Automatic adjustment for valve body distortion.
- Elimination of disc-to-seat friction and galling.
- Uniform wear distribution.
- Extreme simplicity.
- Greater service life.
- Simplified maintenance.

CORROSION RESISTANT VALVES

In addition to conventional iron, bronze and steel constructions, Darling specializes in valves for any corrosive fluid: iron body valves with special alloy trim; iron body, rubber lined, with special alloy trim; all bronze; and all special alloy. Darling's 50 years of experience in meeting unusual requirements is always at your service.

EXTREME SIMPLICITY

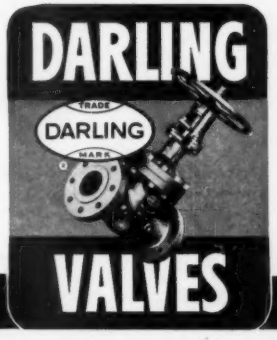
THAT'S all there are—just four simple, sturdy parts—two plain interchangeable no-pocket discs and two husky wedges.

Note particularly that the discs are completely free of pockets. Sediment and scale cannot collect to interfere with their free movement. No links or other devices are needed to hold the discs and wedges together. Any part can be quickly and inexpensively replaced without removing valves from the line. Parts cannot be incorrectly assembled nor become disengaged while in service. Operation and maintenance are equally simple.

Darling valve users are money ahead because of the exceptional service made possible by the ingenious simplicity of the Darling design. These advances, coupled with Darling's modern precision manufacturing methods and advanced metallurgical practice, offer you valve performance at its finest . . . and at the lowest cost. Next time give Darling a try!

DARLING VALVE & MANUFACTURING CO.
WILLIAMSPORT 14, PA.

Outline your service requirements and get complete *information on Darling Valves of the proper type. Or, send for the complete 300-page Darling Catalog No. 17M. It describes Darling Valves of* all *types for* every *normal or unusual service, and for pressures up to 1500 pounds. It's full of helpful information . . . Yours for the asking.*



THE VALVE MARK OF QUALITY . . . WATCH FOR IT

Norblo H.E.L.S. Centrifugal Collector

Norblo Hydraulic Collector

For All Fume or Dust Collection

Norblo Stars

Norblo Automatic Bag Type

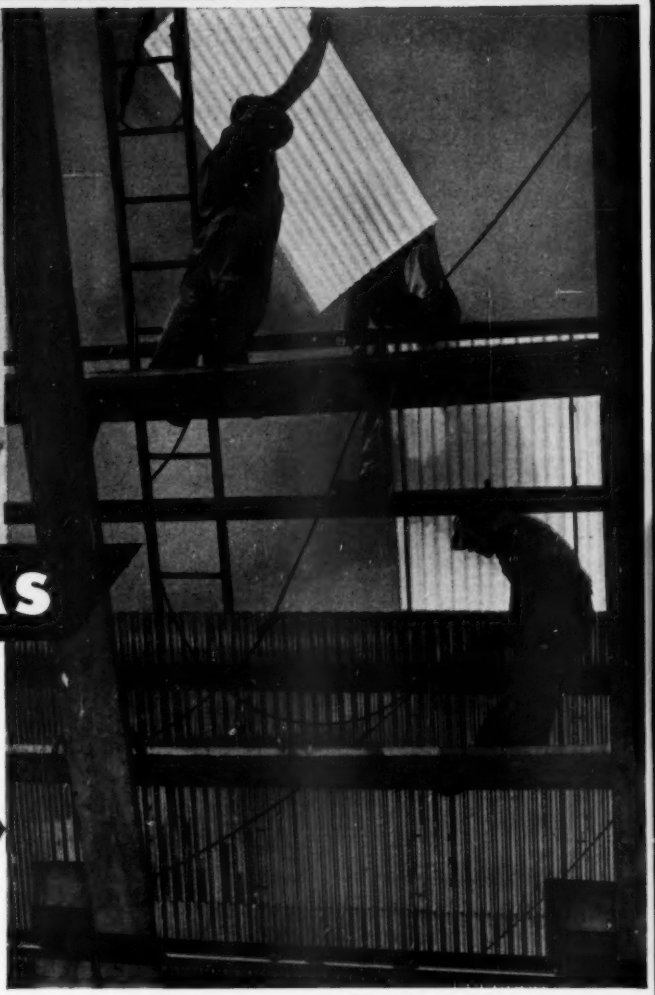
THERE are three basic types of Norblo fume and dust collectors — all of them designed and fabricated in our own shops. Norblo equipment for industrial dust control is outstanding for efficiency with low cost in heavy duty continuous service such as smelting, cement and rock products, chemical processing.

Norblo also makes portable and semi-portable dust collector units. Ask for catalog.

If you have a dust problem or dust creating process that needs control, write us for free suggestions based on 30 years experience.

The Northern Blower Co.

6421 BARBERTON AVENUE
CLEVELAND 2, OHIO



PLEXIGLAS

FILLS THE JOB!

Acrylic plastic PLEXIGLAS *fits right into your glazing program—especially in high-breakage areas. Half as heavy as glass, it's many times stronger, and weather-resistant in the bargain.*

Glazing the window openings in the roof of the University of Delaware's new field house was easy with PLEXIGLAS. Lightweight, white translucent panels, corrugated to match the corrugations of the sheet metal, admit light freely and cut maintenance costs to a minimum. A 15-square-foot panel weighs only 12 pounds. Installed by Sheppheard & Co., Inc., Wilmington, Delaware. Architect: E. William Martin, Wilmington.

Here's the cure for high glazing-replacement costs. Tough PLEXIGLAS, the *outdoor* plastic, withstands hard blows. Both clear transparent and white translucent PLEXIGLAS are light, easy to handle, easy to cut and form—even into curved sections. In hotels, schools, factories, housing projects—wherever breakage is a hazard—PLEXIGLAS more than pays for itself in structural and replacement savings. A recent issue of Rohm & Haas Reporter gives the amazing story of PLEXIGLAS for Glazing. Write for your copy.

PLEXIGLAS *is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.*

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CHEMICALS FOR INDUSTRY

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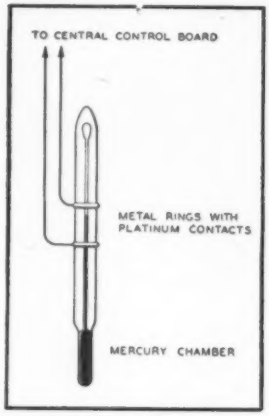
Plant Engineers' Digest

Check a Fire At the Start

A COMPANY in Memphis, Tennessee, has developed the Fire Finder System of fire detection for hotels, warehouses, apartment houses, office buildings, hospitals and ships. This device operates to warn the building personnel of a fire and give its exact location, permitting extinction of the blaze while it is still small and easy to control.

This system consists of an electrical contact thermometer as the primary element, an audible alarm, a wiring system and a central signal board. Thermometers are located on the ceiling or walls of the space to be protected and are electrically wired to an indicating signal light and an audible alarm on a central signal board located



This electric contact thermometer actuates the alarm system, giving the exact location of the fire which enables easy extinction of blaze before it gets a good start

where it can be under constant observation. In those instances where personnel are not present in the building, such as warehouses, this system can be connected with local fire alarm circuits.

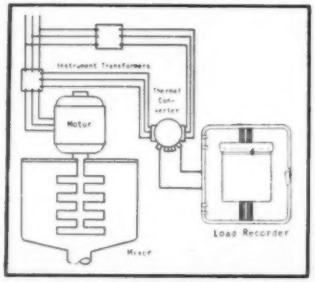
The heart of this system is the Taylor Electric Contact Thermometer, which is secured to insulating posts and housed in a metal frame which is fastened to the wall or ceiling. The thermometer is evacuated and partially filled with mercury so that the top section of the capillary and the upper bulb are under a partial vacuum. The two metal rings are sealed in the glass sidewalls of the thermometer. A platinum wire extends from these rings to the capillary. The rings are connected to a source of power and thus act as a switch. As the mercury rises in the tube, due to increased temperature, it provides contact between the two platinum wires and actuates the alarm system. As the temperature continues to increase, the mercury will rise and fill the top chamber. Further expansion of the mercury results in the rupture of the lower chamber since it is the weakest point of the thermometer. However, due to greater wall thickness of the tube and upper chamber, the remaining portion of the thermometer remains intact and sufficient mercury to complete the contact remains in the upper portion due to the partial vacuum and capillary size bore. The circuit is maintained until the switch and wiring are completely destroyed by fire and intense heat. *From an article on the Callahan Fire Finder System in Taylor Technology, a publication of Taylor Instrument Companies, Rochester 1, New York.*

Load Recorders Guide Operation of Mixing Machines

VISCOSITY of materials in mixing or other types of agitating machinery can often be measured indirectly by measuring the power input to the electrical motor which drives the mixer. In many processes of this type, the materials must be mixed to a given viscosity, or until a definite reaction end point is reached where viscosity undergoes an abrupt change. By experience, viscosity can be related directly to motor input in kilowatts.

For such applications, our Micromax load recorders are being used in a number of plants. Method of installation is straightforward. A thermal converter is connected in the power leads to the drive motor, and converter output is wired to a potentiometer-type load recorder. The instrument continuously records motor input in kilowatts or on some arbitrary scale supplied by the user.

When so desired, the load recorder is equipped to operate alarms on signal lights which inform the machine operator when the end point is reached.

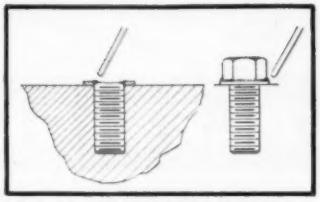


Schematic electrical diagram showing load recorder, thermal converter and mixing motor hookup

For some processes, the recorder can be supplied to provide automatic control, generally by regulating feed of process material. Where several machines are operating in one shop, data from all of them can be recorded on a single Micromax multiple-point instrument. *From a release by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.*

Helpful Hint for Removing Broken Studs and Bolts

HERE IS a sketch showing how to remove broken studs and bolts from castings. This method may be in use throughout the country, but it is presented here because it may be of interest and help to some of the readers. Place a washer over the broken stud or bolt, and using a $\frac{1}{8}$ in. or $\frac{5}{32}$ in. Fleetweld 7 rod, weld the washer to



This one may be old but it is always of help when you need it

the stud or bolt. Use higher current than usual so that the penetration will be deeper. Chip off the slag and weld a nut to the washer. When the redness has left the nut, turn gently. A little penetrating oil sometimes helps. *From an article by Robert C. Mallgraf, in The Stabilizer, a publication of The Lincoln Eleteric Co., Cleveland 1, Ohio.*

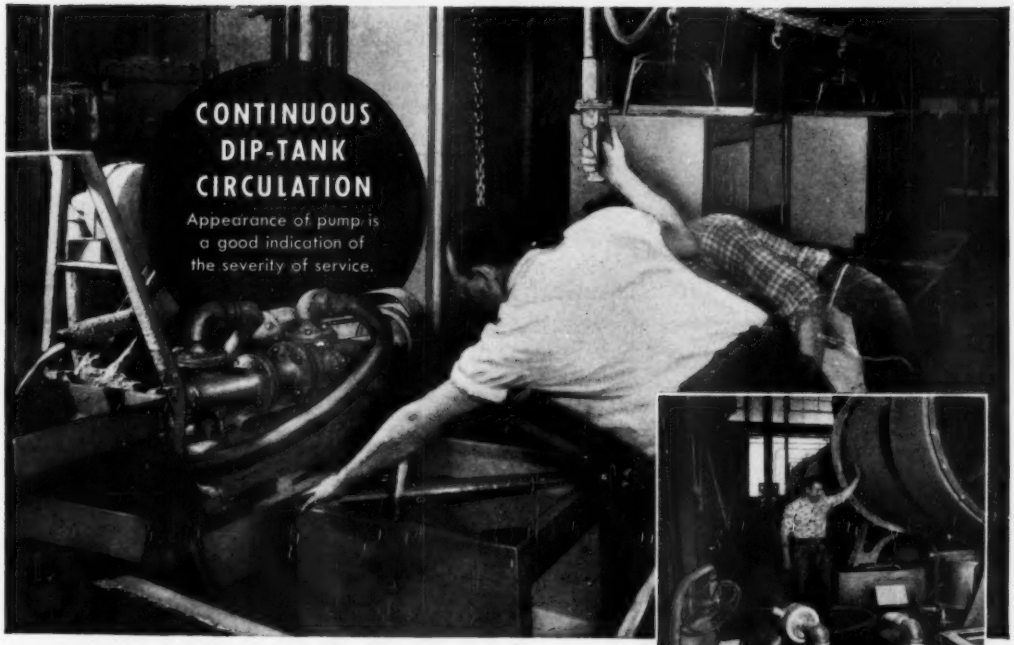
How to Dispose of Burned Out Fluorescent Lamps

HERE ARE SOME suggestions for the safest way to dispose of used fluorescent lamps. If there are only a few lights to be broken occasionally, they should be broken out of doors in a waste area or in a waste container, and the person breaking them should avoid breathing the dust or vapor that arises.

The second situation in which there is a possible danger is the breaking of large numbers of fluorescent lamps, either intermittently or regularly, when hours may be taken in the operation. The following steps should be considered. 1. Break lamps out of doors in waste disposal area or in ventilated hood. To avoid unnecessary dust, the breakage is best done within the waste container. 2. The operator should be supplied with, and required to wear a respirator approved by U. S. Bureau of Mines for toxic dusts. 3. Ultimate disposal of broken lamps should be such that the public and others will not be unduly exposed to powders.

It is recommended that broken lamps

(Continued on page 16)



Hotpoint...

WORLD'S LARGEST RANGE PLANT USES WORLD'S MOST CAPABLE PUMP

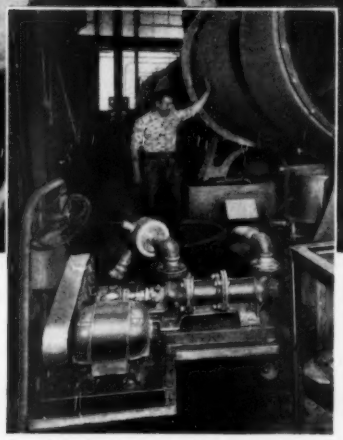
Rated capacity of 600,000 electric ranges per year! That leaves no time to *fuss* with the equipment. And *that's* why Hotpoint's big, new Chicago plant pumps enamel and ground coat with Moynos. These materials are heavy, *highly abrasive,* but the Moyno is their master. The seven pumps, in use sixteen months, have needed virtually no repairs.

NO OTHER PUMP LIKE THIS

Moynos are *famous* for "impossible" pumping—*regardless* of its nature. They have neither pistons or valves. No high-speed impellers. The patented rotor-stator pumping element develops nearly perfect suction vacuum; discharges *without* pulsation at pressures to 1000 p.s.i.

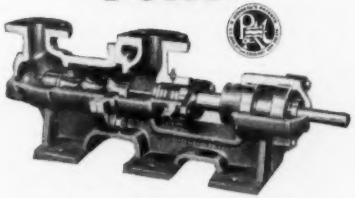
DOES EVERYTHING WELL

Self-priming, *positive* pumping action handles *highly-viscous* fluids with ease; passes particles in suspension; resists chemical reaction and abrasion. Types and sizes for all uses. Your Moyno Man can give you the whole *money-saving story,* or write today for free Book No. P-30E.



Portable Moynos pump 1.7 specific gravity enamel from eight 550-gal. ball mills to overhead tanks—a lift of 20 feet through over 50 feet of line. I. Campbell, Hotpoint's Control Foreman, observes operations

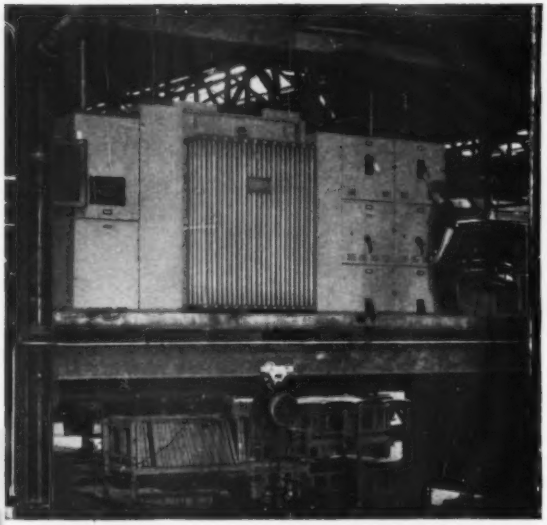
R & M
MOYNO®
PROGRESSING-CAVITY PUMP

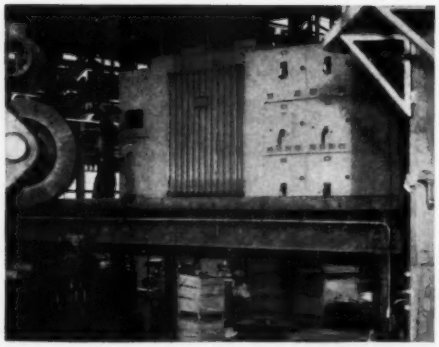


"If It Will Push Through a Pipe You Can Pump It with a Moyno"

ROBBINS & MYERS · INC. MOYNO PUMP DIVISION
Springfield 99, Ohio • Brantford, Ontario

MOTORS • HOISTS • CRANES • FANS • MOYNO PUMPS • FOUNDED 1878





ALL UNIT SUBSTATIONS MOUNTED ON PLATFORMS TO SAVE FLOOR SPACE

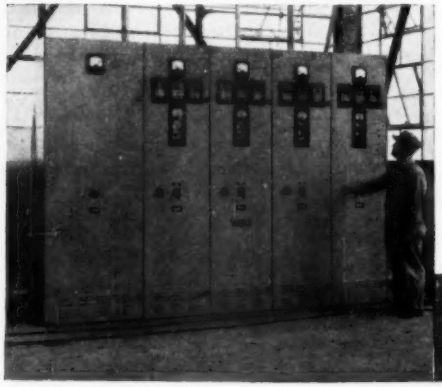
Two views of General Electric 1000-kva load-center unit substation at new Maytag plant. Valuable manufacturing space is saved by locating units on platforms under the roof, right over the center of the load area. Air switch on primary is easy to operate, contacts are easy to see. Air circuit breakers on secondary are of the drawout type, easily removable for inspection and maintenance. Note entire load center is metal enclosed, thus offering operating safety to personnel.

LOAD-CENTER

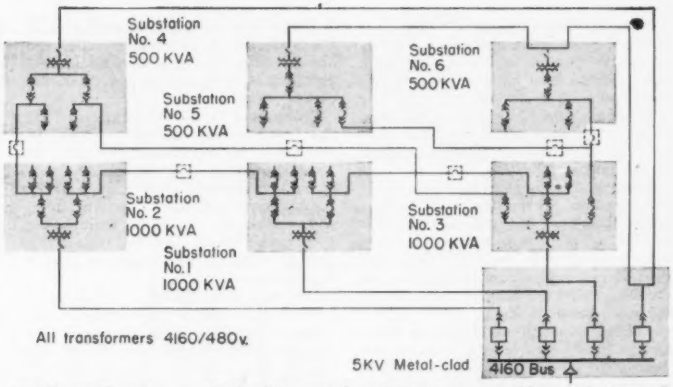
UNIT SUBSTATIONS

Unit substation No. 5, rated 500 kva. Air circuit breaker for future circuit can be inserted in empty upper housing. Drawout breakers are G-E Type AK-1 with 25,000 ampere interrupting rating—plenty of "IC" (Interrupting Capacity) to handle all short circuits. Contacts of 5 kv air switch are clearly visible through window, another safety feature of G-E substations.

G-E 5-kv metal-clad switchgear handles 4160 volts incoming power, distributes it to six load-center unit substations where it is stepped down to 480 volts for utilization. Metal-clad switchgear is neat in appearance, saving in space, and offers safety to operating personnel. Additional sections can be added for future expansion with a minimum of bother and expense.



CONTINUOUS POWER ASSURED MAYTAG BY SECONDARY-SELECTIVE DISTRIBUTION SYSTEM



This secondary-selective system at the new Maytag installation uses General Electric metal-clad switchgear to handle the incoming 4160 volts through four magne-blast power circuit breakers. Feeders distribute the 4160-volt power to six G-E load-center unit susbstations throughout the building where the high-voltage is stepped down to 480 volts for utilization—right at the center of the load area. This eliminates long, costly secondary feeders. Air switches on the primary of all load centers are rated 5 kv. Key interlocks give operating safety to personnel by preventing breaking of the load current with the air switch, or paralleling transformers.

With this secondary-selective system Maytag is insured against a power shutdown in case of failure of any one transformer or its primary feeder cable. If trouble occurs the normally open tie breaker is closed, thus providing an alternate source of power that permits the plant to operate at slightly reduced capacity.

The Maytag installation is a complete General Electric project—one source of responsibility plus the very best in coordinated planning, engineering, manufacturing, and service facilities to give maximum savings and efficiency to the customer.

HELP SPEED PRODUCTION AT THE NEW *Maytag* PLANT AT NEWTON, IOWA

ONLY G-E LOAD CENTERS GIVE YOU THESE FEATURES . . . .

SELECTED STANDARD ratings have been introduced by General Electric to bring you load centers on 20 per cent shorter shipments. The most popular are—

Low voltage	480 △ or Y, 208Y/120 volts
High voltage	2.4, 4.16, 4.8, 12, 13.2, 13.8 kv, delta
Kva ratings	300, 500, 750, 1000, 1500, 2000

Certain other *selected standard* load centers are available. Contact your G-E sales representative for further information.

NEAT APPEARANCE . . . Note the smooth, integrated appearance of these G-E unit substations . . . no more gawky, "old-type" stovepipe connections between transformer and switchgear.

SAVE TIME by eliminating weeks spent over drawing boards detailing individual items. G-E factory-assembled unit substations are quickly and easily installed with lower material and labor costs than required for "piece-meal," makeshift affairs. No last minute "alterations" with hacksaws and cold chisels to make them fit.

INVESTIGATE TODAY how General Electric unit substations can be used in your plant for efficient, flexible power distribution. Contact your G-E sales representative for further information, and write today for the helpful bulletins listed below. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

GEA-3592 Load-center Unit Substations
GEA-3758 Load-center Power Distribution
GEA-3083 Metal-clad Switchgear
GEA-4057 Interlocked-armor Cable for Primary Circuits
GEA-4352 Flamenol Cable for Secondary Circuits

"For our new plant that manufactures Maytag automatic washers, we wanted the very best in power distribution systems. That's why we chose a secondary-selective system using General Electric load-center unit substations. We found that a system such as this would be more economical than any other type. Even though the initial cost was slightly higher than a simple radial system, the fact that we were assured of continuous power for our manufacturing facilities, even though a transformer or feeder cable should drop out, meant that we would save time and money in the long run. We also chose a load-center system because we can easily expand it to take care of any increase in our manufacturing facilities. We also bought 'standard' unit substations because we discovered they would do the job just as well as 'specials'—and at far less cost—and because we could get better delivery. After the units arrived they were installed on the platforms and were operating in a very short time. And dealing with one organization saved us time and money because we could get the engineering, equipment, and service all from one reliable source."

L. C. McAnly, Sr., Manager of Manufacturing,
The Maytag Co., Newton, Iowa

Be sure to see the "More Power to America" full-color sound slidefilm "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.

(Continued from page 12)

not be disposed of in an incinerator, but either be thrown into water or in a dump where they are not likely to be disturbed with evolution of dust.

There is no danger whatever from the lamps when they are intact. The possible dangers come in the destruction of old lamps.

Recently there have been reports of children who cut themselves on broken lamps, and that the cuts healed very slowly and often suffered swelling. Although such cuts do not cause any general sickness or spread further on the body, surgical care is necessary if the cut refuses to heal.

Although precautions should be taken against breathing the dust from broken fluorescent lamps, there is no record of any person suffering injury from breathing dust from the occasional breakage of a lamp. *From the Stimulight-or, a publication of Westinghouse Lighting Division, Cleveland, Ohio.*

Industrial Drying Procedure

DRYING IS essentially the process of concentrating solids. However, for purposes of this article, drying becomes the removal of liquids—usually water or other solvents—from material used in industrial production.

In any drying problems there are four basic parts: 1. Production needs. 2. Knowledge of the characteristics of the material. 3. Determination of the ideal drying conditions for the specific problem. 4. Selection or design of the drying installation.

Production Needs—This is based on the requirements for the material in fabrication of the finished product. If there is a continuous need for the material, drying operation should be a continuous proposition, done in a tunnel with conveyors or similar equipment. If material needs are not fixed, the "batch" type of drying system should be considered.

Materials to be Dried—It is necessary to have a thorough knowledge of the material to be dried. For instance: the moisture content of lumber is usually low in comparison with paper. Paper presents a problem in surface drying; lumber, in interior drying.

Best Drying Conditions—With the materials at hand, from the first two points, it is now possible to determine, by research or from previous experience, the ideal drying conditions. These may be obtained by a simple temperature-and-time arrangement in the drying room: or, the material may require zoned arrangements with different temperatures and humidities.

Drying Room Design — Essentially, the drying equipment will be one of four different types: 1. Convection, using pre-heated air. 2. Radiation—with or without forced air circulation. 3. Conduction, wherein the material is dried by direct contact with a hot surface—here again forced hot air could be the hot surface. 4. Electronic, the generation of heat in the material by high-frequency current—under vacuum or at atmospheric pressure, air circulation would be necessary. *From Weather Magic, Sept., 1949, a publication of The Trane Company, La Crosse, Wisconsin.*

Adhesives Make Progress

THE SYNTHETIC resin glues are termed "adhesives" to distinguish them from the older glues which were of vegetable or animal origin.

The synthetic adhesives are organic compounds produced by polymerization or condensation reactions. This means that many small molecules are combined into a few large, high molecular weight molecules (called polymers). Thermoplastic (linear polymers) are applied as large molecules dissolved in a solvent or dispersed in a liquid and are set by the evaporation of the solvent or liquid.

The thermosetting adhesives, on the other hand, are applied as monomers, or partially-condensed molecules, usually in water or alcohol solutions and sometimes without solvent, and are cured by means of heat, the action of a catalyst, or both. Earlier resins were set or cured only at elevated temperatures but now many of them will cure at room temperature. Some adhesive formulations contain both thermosetting and thermoplastic resins.

The common types of thermosetting adhesives are phenol-formaldehyde, furfuryl alcohol, urea-formaldehyde, resorcinal-formaldehyde, melamine-formaldehyde resins, polyester-styrene copolymers, and modifications of these. The common thermoplastic types are vinyl acetate, vinyl alcohol, vinyl butyral or formal, acrylic, butadiene styrene, butadiene-acrylonitrile, chloroprene, chlorinated and cyclized rubbers, polyamides and vinyl ether resins, cellulose esters and ethers.

The thermosetting resins are generally hard and brittle, while the thermoplastics are softer and more flexible, although the latter have certain disadvantages, such as lower heat and solvent resistance. Some investigators have successfully combined the desired properties of the two classes of resins for certain applications, as the bonding of metal to metal. Metals are particularly difficult to bond because of their rather low coefficient of thermal expansion as compared to that of most resins. Thus, it is important that the cured glue line be somewhat elastic to absorb and distribute the stresses.

The mechanical and physical properties considered most important in evaluating an adhesive are tensile and shear strength, water resistance, durability under various exposure conditions, pH, and sometimes gap-filling quality.

There is no universal adhesive. Answers to the following questions are

(Continued on page 46)

New Keyway Extends Machine Shaft Life

TO DATE no one has come up with an answer to the problem of fastening gears, driving wheels, etc., to shafts other than the key and keyway. They are necessary evils. But they always take strength from the shaft at the point of greatest stress.

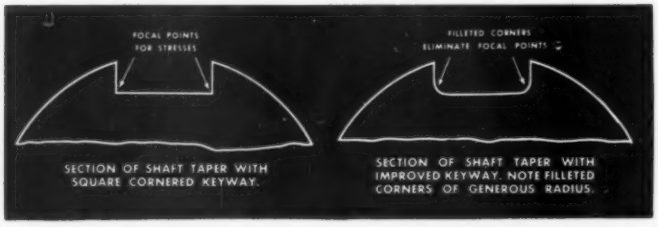
Over a period of years tests have been made on other than conventional types of keyways. The results have been especially interesting on keyways in which the root corners along the bottom of the slot were rounded and were provided with sled runner ends. The drawing shows a sectional view of the two types of keyways.

The best test results have been obtained with fillets on a radius equal to approximately one-half the depth of the keyway. This is also about the most practical fillet dimension from a machining standpoint. Suggested radii are shown in the table.

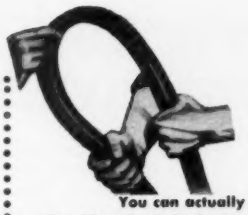
Keyways with fillets at the root corners can be machined the same way as keyways with square corners. Horizontal milling is the simplest operation. Keyways ⅜ in. wide and wider can be milled with solid form-eccentrically-relieved cutters or with interlocking eccentrically-relieved cutters. These cutters are available with the specified radius on the corners. *From Volume 23, No. 2, Inco Magazine, a publication of International Nickel Co., 67 Wall St., New York 5.*

Suggested Radii for Filleted Keyways

Approx. shaft diameter	*Keyway fillet radius*
¾" to 1⅛" incl.	1/32"
1¼" to 2" incl.	1/16"
2¼" to 3" incl.	3/32"
3¼" to 4" incl.	⅛"
4½"	3/32"
5" to 5½" incl.	3/16"
6" to 6½" incl.	7/32"
7" to 8" incl.	¼"


FOCAL POINTS FOR STRESSES
SECTION OF SHAFT TAPER WITH SQUARE CORNERED KEYWAY.
FILLETED CORNERS ELIMINATE FOCAL POINTS
SECTION OF SHAFT TAPER WITH IMPROVED KEYWAY. NOTE FILLETED CORNERS OF GENEROUS RADIUS.

Filleted type design seems to offer two to three times greater service life



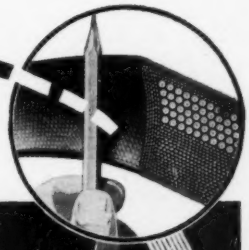
You can actually *feel* the sides of a belt *change shape* as the belt bends.

In Two Minutes You Can See Exactly How . . .

The Concave Side . . .

(U.S. Patent No. 1813698)

SAVES Your Transmission DOLLARS



Take *any* V-belt in your hands and bend it as it bends in going around a pulley. You will see that the top of the belt, being under *tension*, grows *narrower*. The body, under compression, *widens*. The sides *bulge out*.

This shape change—in a *straight-sided* V-belt—is shown in Figures 1 and 1-A, below.

Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove.

Now look at Figures 2 and 2-A. There you see how the *same shape change* affects the V-belt built with the precisely engineered *Concave Side* (U.S. Patent No. 1813698).

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit in Sheave Groove.

The top of the belt narrows, the body widens. But the sides *merely straighten—and* the new shape *exactly fits* the sheave groove!

Two savings result. (1) Uniform side-wall wear *—longer life!* (2) Full side-wall grip on the pulley carries heavier loads and *sudden load increases* without slipping; saves belts, saves *power!*

REG. U. S. PAT. OFF.

The Mark of SPECIALIZED Research

The Concave Side is *MORE IMPORTANT NOW Than Ever Before*

Because the sides of a V-Belt are what actually drive the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley directly through the belt's sidewalls.

Now that Gates SPECIALIZED Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

4910

GATES VULCO ROPE DRIVES

IN ALL INDUSTRIAL CENTERS

THE GATES RUBBER COMPANY

DENVER, U.S.A.

The World's Largest Makers of V-Belts

New Products and Methods

WHAT'S NEW? On these pages the Editors summarize the outstanding industrial developments of leading manufacturers who will supply you, free of charge, the bulletins or other information desired. For ease in making requests use the no-obligation, postage-paid card, pages 19 and 61

1—GEAR HEAD MOTORS

For powering all types of electrically activated devices

Basically a standard motor with a self-contained gear reduction mechanism, the gear head motor is recommended for speed reduction on the basis of compactness, high efficiency and ease of installation or replacement. These are available for single and double reduction requirements in ratings from 1/200 to 1/3 hp in reduction ratios from 6:1 to 900:1, and in output torques from 1 in-lb to 500 in-lb.

Countershaft speeds from 833 to 8 rpm permit their utilization in such widely different applications as door openers, timing devices, conveyor drives. Depending on motor frame size, the countershaft can be located in increments of 30 or 90 deg relative to a horizontal center line by relocating gear head on the frame.

Induction hardened alloy steel worms and bakelite or bronze gears are used to provide high reductions in small space, quiet operation, and long life. Generally the gear head unit has same characteristics as its power source. Suitable for direct connection or other forms of power transmission, supplied in all basic motor types. Robbins & Myers, Inc.

2—OSCILLOGRAPH

For industrial laboratories, is light weight and low priced

Compact and simple in design, the Type FM-18 instrument is designed for operation by inexperienced personnel and can be used for visual indications or for taking oscillograms of current and voltage phenomena. While the standard model has two elements, it can be furnished with three or four. The oscillograph uses an improved type of galvanometer with bifilar suspension which produces high-flux density in the gap.

Priced at $575.00 (F.O.B. factory), the two-element model is furnished with a film pack for processing one or more records before the complete set of negatives has been exposed. This oscillograph can also be furnished with a special film holder which uses Polaroid-Land film and produces finished oscillograms in less than one minute—without the use of a photographic darkroom. Meter and Instrument Divs., General Electric Co.

3—VALVE LUBRICANT

Is compressible for automatic action in plug valves

Hypermatic, a lubricant for use in company's plug valves, is announced as being compressible to half its volume by putting it under pressure. When pressure is removed, the lubricant expands back to its original volume, it is stated. When compressed it is in an "energized" state, manufacturer explains, possessing potential energy like a compressed spring. Thus, when confined in a sealed space, the lubricant is said to fill voids effectively despite any small leakage that may take place.

Manufacturer adds that Hypermatic retains its energy for multiple valve turnings and may be re-energized when necessary by adding more of the same substance to refill valve chambers or by turning lubricating screw. It is reported to fill lubrication voids until confined pressure drops to 50 lb.

Self-acting, the lubricant is held in its energized condition between valve seating surfaces and ball check valve, according to company, and simply reverts to the status of a non-energized lubricant if valve is neglected over long periods of time. Nordstrom Valve Div., Rockwell Mfg. Co.

4—INTERCOM LINE

Offers automatic audio-visual signalling, streamlined equipment

The "Chime-Matic" signalling feature of the new Executone fully intercommunicating systems is said to simplify and speed call-origination. Pressing any button automatically announces call at the station selected by means of a chime and signal light. There is no need for caller to press

talk bar or announce himself, or for person being called to "match buttons" with station calling.

New electronic voice circuits are engineered to give selective sensitivity, according to manufacturer, to "frame" the voice, minimizing high and low frequency background noises and making voices recognizable. Also part of the new circuits is an automatic "blanking impulse" designed to eliminate electronic "key clicks."

Full trunkage switching, it is pointed out, allows as many simultaneous conversations as there are pairs of executive stations and protects against eavesdropping or cutting-in. The new intercom equipment is housed in streamlined cabinets. Expansion kits for additional stations may be slipped into place later in master stations originally installed. Executone, Inc.

5—A-C INDUCTION MOTORS

In 20 to 75 hp sizes, have solid frame for increased protection

The stator frame of these motors is made of solid heavy rolled steel. To control the inner diameter accurately enough to accommodate the stator laminations properly, the frame is rolled from flat steel and welded into a ring while on a mandrel. This solid frame is also intended to permit motor to be wall- or ceiling-mounted with equal protection.

The brackets (or end bells) are drip proof, with the top half solid, and ventilating openings on the lower half only. Both sleeve and ball bearing brackets are available. The sleeve bearing motors are company's sealed sleeve type with air bypass. The ball bearing motors use the self-sealed pre-lubricated bearings. The new motors are being produced in squirrel cage and wound-rotor types, both drip-proof and splash-proof, and will be supplied in standard ratings at 60, 50, and 25 cycles. Westinghouse Electric Corp.

6—UTILITY CLOTH

Is made of non-woven cotton bonded by plastic

Claimed to leave absolutely no lint, the Nun-Lint Polishing Dusting-Wiping Cloth is recommended for industrial jobs requiring a lint-free cloth. Can be washed and re-used many times by soaking in sudsy water, squeezing and hanging for quick drying. Can be used wet or dry, on wood, metal, glass or other surfaces. Rittenbaum Brothers, Inc.

7—LIGHTWEIGHT ACTUATOR

For pneumatic or hydraulic operation of diaphragm valves

Freedom from product contamination, drop-tight shut-off, chemically inert linings and diaphragms, isolation of working parts, low pressure drop and simplified maintenance are claimed possible with this improved remote control. Described as leak-proof, the actuator is company's application of the Bendix-Westinghouse roto-chamber principle utilizing a rolling sleeve seal.

The valve diaphragm is protected from excessive closing pressures by an adjustable positive stop. Long life and trouble-free operation of the seal are predicted. While pneumatic or hydraulic pressures up to 105 psi may be used, usually only 50 lb of actuating pressure is required to close the valve against 100 lb pressure in the line being controlled. Pressure requirements vary with type of diaphragm required for the gas, liquid or solution being handled.

Actuators are available in three combinations: air-to-open, air-to-close, and double acting, in sizes to handle company's diaphragm valves. Grinnell Co.

8—HUMIDIFYING UNITS

Are designed for atomization of water, chemicals and insecticides

Described as an inexpensive but dependable moisture and humidity control, these units are engineered to maintain moisture

uniformity. Health and fire protection are two advantages stressed. By eliminating dry and dusty working conditions, the dangers of spontaneous combustion are minimized and static electricity is

(Continued on page 22)

Bulletins on Current Plant Problems

MATERIALS HANDLING

101 Locomotive Crane—Catalog 609-I-4, 16 pp, points out the many ways in which company's Diesel electric locomotive crane is an economical investment. Text and illustrations present evidence to show how electric tractor cuts maintenance costs, and cover in detail the crane's interlocking gib ring, truck assembly, drive mechanism, air controls, power unit generator and deck design. American Hoist and Derrick Co.

102 Coal Handling—Eight-pp Form MS 909A-1046 covers use of manufacturer's crawler tractor in the storing and handling of coal. Explains how its use permits fireproof storage of coal, the economy afforded by both original cost and operating cost, and the flexibility of the tractor. Describes and illustrates a modern coal handling installation. Also discusses and pictures coal storing and reclaiming operations handled by the tractor in combination with scrapers and bulldozers. Allis-Chalmers Mfg. Co.

103 Car Pullers—Capstan, drum and continuous rope type electric car pullers are described and illustrated by photos in 8-pp Catalog 100-31-130. Specifications, dimensions are provided, also a brief discussion of factors involved in selecting a car puller, including starting line pull and track curvature. American Hoist and Derrick Co.

104 Belt Conveyer—A light duty, roller bed conveyor available in overhead, table or floor types is the subject of 4-pp Bulletin PAS-1A-3. Illustrated with photos of each type and diagrams of arrangements, it provides standard specifications and dimensions. Stresses ease of speed control and simplicity of replacing belt. Inland Equipment Corp.

105 Handling Systems—This 4-pp bulletin presents an overall picture of company's engineered conveyor and handling systems. Illustrated by drawing, a complete foundry handling system, and eight photos show systems designed for textile, small parts, rubber, food processing and other industries. Other photos show a fast portable power conveyor and racks and bins for storing. Mechanical Handling Systems, Inc.

106 Materials Handling Equipment — Catalog 1201 MH, 30 pp, presents manufacturer's line of materials handling equipment. Covers motorized trucks and tractors, packaged running gear, hand trucks, roller conveyors, load lifts, skids, jacks and a wide range of related equipment. Profusely illustrated with photos and sketches the book contains application data, complete specifications, sizes, capacities and prices. Materials Handling Div., Market Forge Co.

107 Belt Booster — Four-pp Bulletin PB64-70-3A provides specifications, dimensions and other engineering data on company's stationary belt booster for light medium duty applications. Photos show complete assembly, power units, bearing details and a typical installation. Inland Equipment Co.

108 Materials Handling Analysis Guide—Plant engineers will find the answers to some of their handling problems in this small 36-pp booklet. Although it stresses use of company's lift trucks and tractors, it provides helpful suggestions on the analysis of handling, trouble shooting and improved storage methods. Towmotor Corp.

109 Tractors and Trucks—Various types of fork trucks, platform trucks and industrial tractors for a wide range of loading and handling jobs are illustrated by photo and catalogued in Bulletin 1430-S, 4 pp. Includes capacities, weights, speeds, engine ratings and construction specifications. The Buda Co.

110 Materials Handling Attachments — Attachments, tools and accessories designed to lower cost and increase ease of moving materials with manufacturer's lift trucks, straddle trucks and mobile cranes are described in a 28-pp catalog, Form 1139. Model views, diagrams, specifications, section pictures, cartoons and explanatory text are used to bring out features of special purpose additions to basic handling machines. These include company's attachment which side-squeezes loads, non-revolving paper roll grabs, booms, rams, side shift carriages, tile-handling arms, extension forks and revolving aprons. Hyster Co.

111 Hoisting Equipment — Twenty-pp pocket-size Catalog DH-919-A gives prices, capacities, ordering information and application data on a wide variety of hand and electric hoists, as well as overhead trolleys and cranes. All equipment is illustrated by photos and general specifications are included. Wright Hoist Div., American Chain & Cable Co., Inc.

112 Sling Chart—This is a wall chart intended to simplify selection of sling chain for every requirement and provide a permanent record of performance for specific chains used in the plant. Companies already using this chart report finding the information valuable, especially for personnel safety. Data on alloy and iron chains and working load limits of sling chains in 9/32 to 1 in. sizes are shown, as are weights of loads that can be lifted when a given sling is used as angles of lift from 15 to 90 deg. Standard single, two, three- and four-leg chains are shown with various attachments. Back of chart provides definitions, instructions and cautions governing use of chains. Also includes table for recording chain performance and space for identifying chain, recording dates of purchase, inspection. McKay Co.

113 Automatic Tongs—A representative assortment of company's automatic tongs in 50-lb to 250-t capacity for lifting and transporting a wide range of materials is illustrated and described in this 22-pp catalog. Sketches and text cover operation of tongs and their advantages. Many photos show them handling ingots and molds, barrels, coiled strip, bales of cotton and paper, slabs, pipe. Included are table of dimensions, capacities of various types and an outline of preliminary data required by company when creating a tong design. Heppenstall Co.

ELECTRICAL

114 Industrial Bus Duct—A flexible, continuous outlet, electrical system providing a power source of feeding portable tools, cranes and hoists, draw racks, milling machines and other equipment is described and illustrated in Bulletin 472, 32 pp. Explains how system works and discusses and pictures several applications. Mounting suggestions and installation instructions are provided. Straight and curved sections, fittings, and trolleys are covered in detail, and complete engineering data included. BullDog Electric Products Co.

115 Magnetic Relays—Twelve-pp Catalog D-20A fully illustrates and describes seven standard types of relays for industrial and general purpose control applications. Complete technical data on relay ratings, dimensions, coil specifications and applications are included. Relays listed are available from stock. Ward Leonard Electric Co.

116 High Amp Cable—Compiled to aid those concerned with low voltage wiring, 24-pp Catalog 5478 presents the practical advantages of this cable, at the time of installation and afterward. Describes and illustrates its asbestos insulation and gives reasons why use of this cable cuts wiring costs. Engineering data includes conduit size tables, calculator, graphs for power wiring and information on figuring cable requirements. Rockbestos Products Corp.

117 Alloy Resistors—Bulletin 1032, 8 pp, describes corrosion-resistant alloy resistors for use with safety limit stops to stop d-c crane-hoists quickly by dynamic braking. Includes discussion of standard features, limit stop installation and technical data covering dimensions and sizes of available types, and limit stop connections for use with d-c lowering controller, d-c reversing controller and a-c controller. Contains photos of switch assemblies and interiors. The Electric Controller & Mfg. Co.

118 Centrifugal Switches—Bulletin 1001, 4 pp, gives application and engineering data on manufacturer's pilot circuit switches controlled by centrifugal force designed for plugging, overspeed or under-speed protection, non-plugging and motion underlocking. Photos illustrate construction features and sequence of operation is described. Discusses, briefly, six different models and their special applications. The Euclid Electric & Mfg. Co.

INSTRUMENTS and CONTROLS

119 Self-Operating Regulator — Bulletin 328, 4 pp, contains information on a regulator for use on water and oil heaters, crude oil treaters, tanks, vats and other processing equipment. Includes tables helpful in selecting the proper size regulator and illustrates the broad scope of

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Bulletins on Current Plant Problems

automatic control. Also contains layout drawings of several applications of this regulator. The Powers Regulator Co.

120 Flow Meters—Bulletin 400-F2, 8 pp, features company's meters for measurement of steam, air, or gas flow in 1 or 1¼ in. pipe lines, and designed for installation directly in line being metered. Illustrated with photos of meter, sectional and dimensional drawings, the bulletin explains how meter operates and discusses its advantages. Gives typical specifications and includes correction factor charts and capacity tables. Builders-Providence, Inc.

121 Industrial Thermometers—Complete data on liquid-in-glass thermometers is presented in tabular and sectionalized form in 16-pp Bulletin E. Illustrates basic models, sizes, forms and attachments with simplified application data to enable user to select right instrument for any installation. Includes a discussion on important design details illustrated with large cutaway drawing. Precision Thermometer & Instrument Co.

122 Combustion Control — Technical Bulletin 103, 8 pp, contains an exposition of the nature of flame and its use as a combustion index and a description of devices ranging from the simplest auxiliary controls for addition to present systems to complete electric-eye installations. The information includes a discussion of methods of control for all hydro-carbon fuels, including oil, gas and bituminous coal of varying analyses, burned separately or together. Contains many installation photos. General Power Plant Corp.

123 Combustibles Recorder—Design improvements and new applications for company's combustibles recorder are featured in 16-pp Bulletin 180-A. Drawings and photographs explain how this electronic type instrument operates on the catalytic combustion principle. Typical applications to boiler furnaces, atmosphere producers, rotary kilns, industrial furnaces and chemical processes are illustrated. Both air and electrically-operated control of combustibles are pictured and described. Also described is the recorder's a-c measuring circuit. Bailey Meter Co.

124 Metal Defect Detector—Company's "Reflectoscope," an ultrasonic instrument for locating defects in metals and other materials is featured in 4-pp Bulletin 30-105. Illustrated with photos of searching unit and some of its applications, it explains instrument's principle of operation. Includes specifications, discussion of general applications. Sperry Products, Inc.

125 Metal Protecting Wells—Catalog 200, 44 pp, covers company's metal protecting wells for the detecting elements of practically all types of temperature indicating, recording and controlling instruments. More than 30 wells are listed with sizes and ordering information and illustrated by photo and dimensional drawing. Includes general specifications and tables showing properties of available metals and metals recommended for use with different materials. Special equipment is also described and illustrated. Trinity Equipment Corp.

PIPING, HOSE AND ACCESSORIES

126 Small Pipe Markers—Printed in three colors, 2-pp Bulletin 144 describes and illustrates self-adhesive pipe markers for identifying small diameter pipe and conduit, from ⅛ to 2 in. dia. Description also covers other sizes of markers for larger pipe and conduit. Markers shown conform to ASA standard for identification of piping systems. Sample marker included. W. H. Brady Co.

127 Spiral Weld Pipe—Four-pp Bulletin 462 shows sizes and wall thicknesses available in company's spiral weld pipe, and lists some of its applications. Also provides dimensional data on light wall fittings and steel flanges for use with this pipe. Taylor Forge & Pipe Works.

128 Industrial Piping—This 4-pp bulletin gives at-a-glance information on company's piping, showing available materials and the chemical products they handle. Covers wood stave, wood lined, Saran rubber lined pipe, and stainless steel and monel tubing. Illustrates and describes wood piping in detail, discussing its advantages and applications. Michigan Pipe Co.

129 Pipe and Conduit Tools—Bulletin 30 B, 4 pp, covers hydraulic power equipment for installing pipe and conduit, including knockout punches, and thin wall and rigid conduit benders, as well as an electrically driven hydraulic pump. Includes photos of tools and attachments. Blackhawk Mfg. Co.

130 Hose Couplings—Bulletin 5, 4 pp, describing and illustrating manufacturer's line of suction and water hose couplings covers combination male hose nipples, brass and malleable suction and water hose coupling, hose pipe and adapters. Items shown for the first time include brass suction and water hose couplings using a hexagon swivel nut in place of the usual pin lug, petroleum couplings especially designed for handling bulk crude and petroleum as well as water, and fire hydrant reducer for coupling 4½ and 1 in. hose to fire plugs. Hose Accessories Co.

VALVES

131 Blow Valves — Eight-pp Bulletin B-440 features motor-operated and remote controlled seatless blow valves for use on the large digesters used in cooking paper pulp. Discusses advantages of these valves, explains how they operate, and provides dimensions and a list of parts. Includes suggestions on installation and operation, and photos of several typical installations. Yarnall-Waring Co.

132 Air Release Valves—Bulletin 1200, 8 pp, devoted to company's air release valves, includes a discussion on air in water pipe lines and the essential requirements for valves of this type. Illustrates methods of installation and explains valves' construction and operation. Covers types for standard, high pressure and special services. Contains photos and diagrams of the valves and a large cross section showing materials of construction. Simplex Valve and Meter Co.

133 Air Control Valves—Four-pp Folder A presents air control valves for a wide range of applications. Knob, lever, cam, foot, treadle, cylinder and diaphragm types are pictured and basic design is shown in cutaway diagram. A series of sectional drawings illustrate air flow. Solenoid valves are also discussed and illustrated. Valvair Corp.

134 Air Valves — Twelve-pp Bulletin AV100 illustrates and provides dimensions and specifications for company's standard air valves for remote control of single and double-acting air cylinders. Covers button, lever, cam, clevis and foot operated types. Also describes and illustrates four-way valves with integral speed controls and speed control valves. The Bellows Co.

135 Face-to-Face Valves — Twelve-pp Catalog 12 introduces a line of 50-lb narrow face-to-face valves designed especially for rugged hydraulic service. The various types of valves and controls are described and illustrated. Also presented are the stuffing boxes, which include plain, lubricated, lubricated with purge connections, and rotary seal types. Advantages of the valves, a description of the rubber seat, special metals and dimensions and weights provide essential engineering information. R. S. Products Corp.

136 Gate Valves—Four-pp Bulletin AD 1203 presents company's fluid-motor operated gate valves and an explanation of how they help to increase plant efficiency and promote lower operating costs. Text tells how the fluid motor works and is illustrated by photos and sectional drawings. Available types and sizes listed. Crane Co.

137 Gate Valves — Specifications, sizes, and dimensions for company's bronze gate valves of heavy duty construction for use on steam, water, oil, or gas lines are provided in pocket-size Circular 102. Brief text discusses maintenance, installation and operation of these valves. Photos illustrate screwed and bolted bonnet types. Large cutaway drawing shows design features. The Kennedy Valve Mfg. Co.

PUMPS, TURBINES BLOWERS

138 Centrifugal Pumps—Double suction, single stage pumps are the subject of 8-pp Bulletin 104. Describes and illustrates details of construction, including company's "Adjusto Ring." Discusses points to be considered in selecting a pump and contains several photos of these pumps. Frederick Iron & Steel Co.

139 Multi-Stage Turbines—Catalog 4200, 24 pp, includes a discussion of the economics of by-product power, along with diagrammatic sketches that show the utilization of heat for various typical plant operating conditions. Emphasizes the flexibility of turbines' drive and shows basic types of company's turbines for different operating conditions and applications up to 20,000 hp. Many photos are devoted to

(Continued on page 61)

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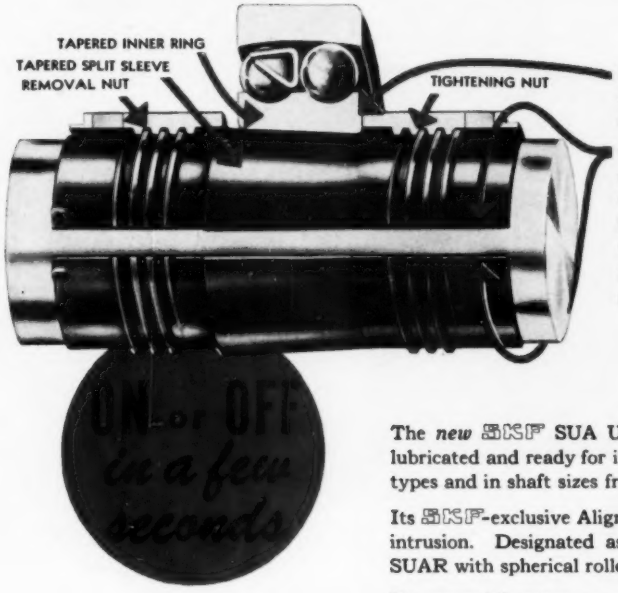
SOMETHING NEW!

SKF introduces the

SUA UNIT PILLOW BLOCK

featuring a tight fit
between bearing and shaft

Here's How It Works



TIGHT FIT results when the tightening nut pushes the tapered inner ring over the tapered split sleeve.

CONCENTRIC GRIP is firm and positive—as the split sleeve contracts and wraps around the shaft. Removal is accomplished by reversing the process—with tightening nut loosened, removal nut pushes inner ring off the sleeve.

ON or OFF *in a few seconds*

The *new* SKF SUA Unit Pillow Block is completely assembled, lubricated and ready for immediate use. Available in "free" or "held" types and in shaft sizes from $1\frac{7}{16}$" to $2\frac{7}{16}$".

Its SKF-exclusive Align-O-Seals prevent lubricant leakage and dirt intrusion. Designated as type SUA with ball bearings—and type SUAR with spherical roller bearings.

No exposed bearing . . . no lock screws to raise troublesome burrs on the shaft . . . the nut is locked to the sleeve . . . and even though the shaft vibrates, the concentric grip will not loosen.

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Bearings and pillow blocks engineered by **SKF**

New Products and Methods

(Continued from page 20)

grounded. It is also pointed out that colds and respiratory ailments are reduced as a result of effective humidity control.

Available in three sizes the units will diffuse up to 1, 2, and 3 gal of water or other liquid per hour. These capacities are claimed sufficient to control humidity within a 2 per cent fluctuation in areas of 15,000, 30,000 or 45,000 cu ft of space. The required air pressure is 6 cfm at 40 lb, supplied by compressor. Paasche Airbrush Co.

9—OXY-ACETYLENE HOSE

"Twin" type, has two lengths joined by a thin strip of rubber

The Duo-Weld Oxy-acetylene hose features one red length and one green length joined together. Molded finish cover is smooth, and reinforcement consists of one braid of high tensile hawser cord cotton yarn. In the $\frac{1}{4}$ in. size this is said to give strength comparable to many two braid single line constructions.

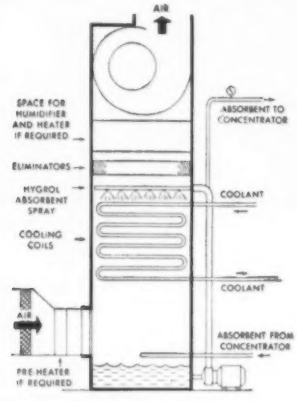
The rubber strip joining the two hose lengths is described as high quality stock and extremely flexible. This strip allows hose to be separated into single lengths, when desirable, without tearing covers. Hose is made in 50, 25, and 12½ ft lengths, with the $\frac{1}{4}$ in. size stocked. Each length is separated 18 in. from each end and secured with a metal ferrule at the separation point. The B. F. Goodrich Co.

10—HUMIDITY EQUIPMENT

For control of temperature and relative humidity conditions

The "controlled humidity method" is described as a system of air conditioning giving complete control of temperature and relative humidity, holding constant conditions or varying them at the will of the user. Especially, it provides dry air at normal atmospheric temperatures with little or no refrigeration required.

The apparatus is enclosed in a casing through which air is drawn by fans. The filtered air enters a chamber where it is dehumidified in passing through a spray



of "Hygrol" liquid (a hygienic hygroscopic chemical that absorbs air-borne moisture and contains no salts or solids). In the same chamber are located cooling coils which remove latent heat of evaporation and handle necessary sensible heat removal. The air stream then passes through entrained moisture eliminators and is diffused in the space to be conditioned.

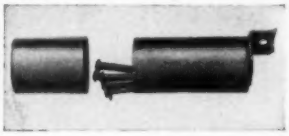
The absorbent liquid spray falls into a tank at the base, from which it is piped to a concentrator which removes moisture taken from the air. The reconcentrated liquid returns to the system. This process is continuous, and the apparatus operates at full capacity at all times.

The same equipment may be used for winter air conditioning by installing a tempering coil at the outdoor intake, humidifier, and reheat coil above the eliminators. Equipment comes in a range of sizes providing from 1000 to 20,000 cfm of conditioned air from a single unit, and multiple unit installations are practical. Applications generally are in a temperature range from 35 F upward. Niagara Blower Co.

11—STORAGE CONTAINER

For spare fuse links, is weather proof, sturdy, and low priced

This container, made of strong, durable aluminum, is equipped with a galvanized steel bracket for easy pole-mounting. By storing spare fuse links of the proper size

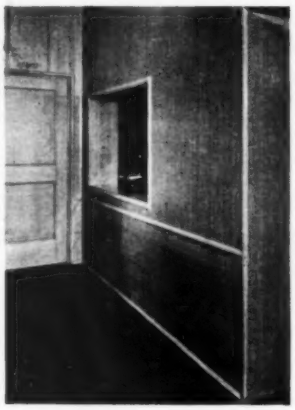


at the cutout location, linemen can restore service more quickly in case of outages. The bright aluminum finish is readily visible from the ground. Transformer and Allied Products Divs., General Electric Co.

12—WALL PANELING

Has tough, durable plastic surface and attractive appearance

A plastic laminated material, Lamidall features a plastic surface, tempered Masonite Presdwood base and distinctive colors and patterns. Its surface is said to resist heat, moisture, abrasion and impact and be unaffected by water, soap, beverages, fruit juices, alcohol and common solvents.



Lamidall's modern appearance, ease of cleaning, durability and economy make it ideal for wall paneling or wainscoting in all types of industrial plants. Panels can be applied by nailing or cementing to existing walls without costly preparation, the backing adheres to wall surfaces. Panels come in sizes up to 4 ft by 12 ft in a selection of colors, patterns and wood grains. Woodall Industries, Inc.

13—PACKAGING PROGRAM

For lubricating equipment, offers several advantages

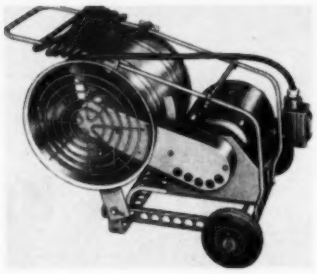
Better inventory control, increased protection to parts, positive identification and lower stock handling costs lie behind the new packaging program for company's lubricating equipment. Contents of the package are individually heat-sealed inside a transparent polyethylene bag which protects the parts against dirt and moisture and prevents corrosion. Inside the bag is an identification card carrying the name and model number of part or equipment.

The sturdy metal-edge boxes with standardized color scheme for quick identification give extra protection against crushing. Boxes stack neatly, even after rough handling and repackaging. A new label design identifies the part by using a line drawing as well as the name, part number and quantity packed in the box, thus speeding up order filling and simplifying inventory control. Lincoln Engineering Co.

14—PORTABLE VENTILATORS

For use in high temperature and noxious atmospheres

Equipped with high-velocity fans powered either by gasoline or electricity, the M.S.A. Portable Ventilators are designed to provide both ventilating and cooling air, and are so compact and lightweight they can be wheeled to the job. Air is conveyed through a 14-in.-dia, 16-ft-long canvas duct, treated for flame and mildew resistance. When not in use it can be collapsed and folded. A two-way air flow feature permits duct to be connected to either inlet or discharge side of fan—allowing both dust or noxious gases to be drawn from the area, and fresh ventilating and cooling air supplied to the area.



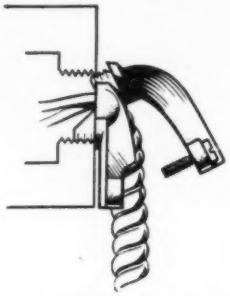
The ventilators are described as ideal for cooling and ventilating tunnels, manholes, engine rooms, storage tanks. And they are said to be valuable for exhausting gases and vapors, removing fumes from welding operations, and withdrawing dust during sandblasting, cement unloading, plaster chipping. Up to 32 ft of duct may be connected on the belt-drive models to either inlet or discharge side of the fan. Ventilators may also be connected in series, considerably reducing power requirements. Mine Safety Appliances Co.

15—ANGLE CONNECTORS

Threaded type, for use on ⅜ in. armored electrical cable

This threaded-type 90 deg connector is made of special aluminum die-cast alloy, and is similar in design to previous models made for ⅞ in. knockout openings. The same cam-wedge principle is employed to provide positive grounding and positioning, even when subjected to severe vibration.

Known as Harbot Model 238T, these connectors are installed after wiring is completed. It is not necessary to first screw



in the completed part. Connector has three parallel ridges or serrations on the lip of each of two parts. These serrations match standard ½ in. IPS female threads in switch boxes, motor housings, Condulets, and the like. By tightening two machine screws joining the two parts the serrations engage the threads for a firm connection, the cam-wedge action increasing the pressure against the threads as the screws are "pulled up home." No

(Continued on page 50)

THE GOOD RIGHT HAND OF INDUSTRY

Meet the Only

NEW Air Compressor Line *Since the War*

It's the Worthington Balanced Angle—the really modern-looking vertical air compressor that is as up-to-date *inside* as out!

See how this machine has been redesigned from the bottom up to give you everything we know you want in an air compressor—

You Get Smoother Performance because the V-type cylinder arrangement gives better running balance and faster cooling.

You Get Higher Efficiency because the isolated cylinders have 35% more heat radiating surface than in-line type; the aluminum heads release heat faster than cast-iron; and the high-speed fan throws 6 times as much air across the cylinders.

You Get Lower Maintenance because the valves are exclusive Worthington Feather* Valves; lubrication is controlled; bearings are famous Timken roller bearings, including oversize main bearings.

You Get Longer Life because the pistons in each stage, though different in size, *weigh alike*, reducing vibration; crankshaft is drop-forged steel with integral counterweights; bearing pressures and piston speed are low.

Your Worthington Air Compressor Distributor has a complete line of single and two-stage models, bare or tank-mounted, ½ to 15 hp.

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*Reg. U. S. Pat. Off.

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PUMP AND COMPRESSOR MERCHANDISING DIVISION
HARRISON, NEW JERSEY

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Maintenance and Operation

Mechanical Control Positions Edge of Rolled Sheet

Contributed by Askania Regulator Co.

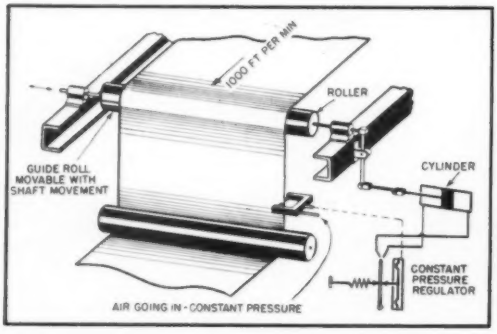
THE EDGE POSITION of any sheet-like material entering a process over rollers can be controlled within limits as narrow as plus or minus 0.05 in. by mechanical means and without touching the sheet. Standard control components, with the addition of a pair of air nozzles, does the job.

Nozzles are used to pass a narrow stream of air past one edge of the sheet. The air comes from one nozzle and is received by the other, which is connected to the diaphragm of a regulator. Moving between the air nozzles, the sheet cuts a certain amount of air flow to give an impulse to the diaphragm.

This impulse is transmitted to the diaphragm of the regulator which then supplies power to the cylinder shown in the drawing, to change the position of the sheet on the roller either by pivoting the axis of the roller or by moving it from side to side. When the sheet moves to the right or left it cuts off more, or less, of the air flow, changing the impulse on the regulator until a control position is reached.

In the case of an endless belt conveyor which has a crowned roller, advantage is taken of the fact that a sheet will tend to center about the top of the crown. By pivoting the axis of the roller, the cylinder actually changes the position of the top of the crown in order to change the position of the sheet in response to the air flow impulse on the diaphragm.

When the operation is coiling or coating, the cylinder tilts the roller to move the sheet. Positions of the air nozzles can be changed with a handwheel in order to change the desired position of the sheet in relation to the center of the roll. When the air nozzles are moved to one side or the other, the sheet will follow them until the proper controlling impulse is received by the diaphragm.



Schematic hook-up of the edge-positioning device. When actuated by the diaphragm the cylinder moves the roller to position the sheet. This type of hook-up can successfully be used on a coating or coiling operation

Hydrometer and Thermometer Maintenance and Use

Contributed by Gould Storage Battery Corp.

PERHAPS THE two most important tools in the battery room are the hydrometer and thermometer. They indicate the state of charge of the battery and whether it is ready to do a day's work.

The care of the hydrometer and thermometer is simple. It requires only that they be wiped dry and returned to their assigned place after use. They should be kept clean to prevent foreign particles entering the battery. Occasionally, the hydrometer should be taken apart, the float and the inside of the barrel cleaned, and the float examined for defects.

As important as the care of this equipment, is its correct use. When using the hydrometer, the rubber nozzle is placed into the battery vent opening, and enough electrolyte drawn into the barrel to permit the float to ride freely, not touching the barrel at any point. The hydrometer is held in a vertical position, and read with the eye level at the electrolyte mark. If the hydrometer must be removed from the vent for reading, the nozzle should be pinched tightly or a gloved finger placed against the opening to prevent dripping of electrolyte. The float scale is read at the electrolyte level, disregarding the curvature of the liquid.

Correction of specific gravity must be made on the basis of plus or minus three points of gravity for each 10 F electrolyte temperature. Using 77 F as a base, three points of gravity are added for each 10 deg above base and three points subtracted for each 10 deg below.

This correction is necessary to obtain accurate specific gravity readings. As the temperature of the acid rises, the acid expands and is, therefore, not as dense. The float then rides low, giving readings lower than normal. Conversely, when the acid is cold, the float rides high and the reading is higher than normal. The following are examples of how this correction factor is applied.

Hydrom. Reading	Thermom. Reading	Correction	True Sp. Gr.
1.250	87 F	plus 3	1.253
1.210	80 F	plus 1	1.211
1.180	64 F	minus 4	1.176

Some thermometers, specially designed for battery application, are scaled to permit ready correction of gravity readings. Adjacent to the regular temperature scale is a second column of figures, preceded by a plus sign above 77 F and a minus sign below. Reading the figures at the mercury level ascertains the amount of correction necessary. Thus, if the hydrometer reading is 1.260 and the second scale on the thermometer indicates plus 8, the true specific gravity of the electrolyte is 1.268.

When unpacking a new hydrometer, rubber bulb, glass barrel, rubber nozzle, and float should be checked for breaks or cracks. Any dirt or packing material should be washed from the parts to prevent any foreign material from getting into the electrolyte. The large end of the rubber nozzle slips into the glass barrel, being securely held in place by tension of the rubber in the barrel. To facilitate insertion of the nozzle, the rubber and glass should be lubricated with plenty of water. The rubber bulb can be attached in the same manner. It is advisable to wear gloves when assembling the hydrometer as there is always a possibility of glass breakage.

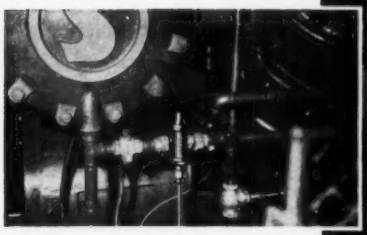
Bus Duct Solves Power Distribution Problem

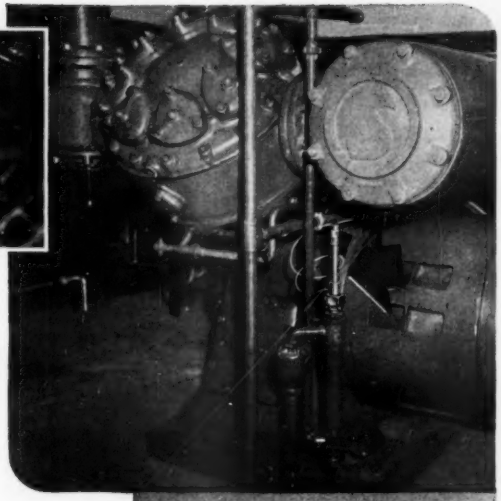
Contributed by Westinghouse Elec. Corp.

IN PLANNING the giant United Air Lines maintenance base in San Francisco one of the most challenging problems was how to provide power to the more than 1,000 electric motors required to drive machine tools and other equipment. Bus duct was the solution to the problem.

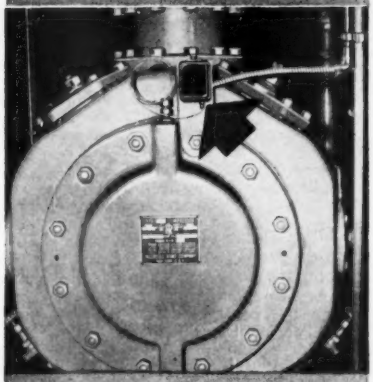
Because of the size and diversification of the operation, in an industry subject to rapid technological advances and developments, a high degree of flexibility was essential. Provision has been made, in the system, for additional units and

2/3 OF COOLING WATER *Saved!*





The Engineer at The Harvey Metals Corp. is well pleased with the Sarco TR-21 cooling control on this big compressor in Chicago. And so is the management because up to ⅔ of the metered water used for cooling is now saved. The engineer says: "With several thousand dollars tied up in a compressor, you are going to open up the cooling line wide and play safe, unless you have cooling control. Yes, we use the warm water too, but it used to overflow the hot well continually."



Bell rings and red light flashes when compressor cooling water gets too hot.

OTHER SARCO COOLING CONTROLS

When you merely want to protect the engine or compressor and don't care about the water there are several Sarco combinations available. You can put a high limit control on the compressor which will flash red lights and ring the gong when danger is near. Or you can just put on a Sarco Control that shuts down the compressor when the water gets too hot. For smaller compressors and vacuum pumps, the Sarco TR-40 Cooling Control is inexpensive, goes into the line like a T and is saving up to 50% of the water on many jobs.

ASK FOR BULLETIN No.700 ON SARCO COOLING CONTROLS

SARCO
SAVES STEAM

SARCO COMPANY, INC.
Represented in Principal Cities
Empire State Building, New York 1, N. Y.
SARCO CANADA, LTD., TORONTO 5, ONTARIO

IMPROVES PRODUCT QUALITY AND OUTPUT

Fastening new conduit connections and running them to a machine is a simple job at United Air Lines Maintenance Base. Photo shows portion of machine shop section

changing methods at the maintenance base, hence much of the equipment is portable or semi-portable.

There are six parts to the bus duct system. The main building has four 500-kva transformers located in each of four sections of the structure. In the hangars there are two additional transformers rated at 200-kva. A separate bus duct system is served by each of these transformers. The systems are three-phase, four-wire, 120-208 volt A-C making it possible to use any combination of single-phase and three-phase machines in any area.

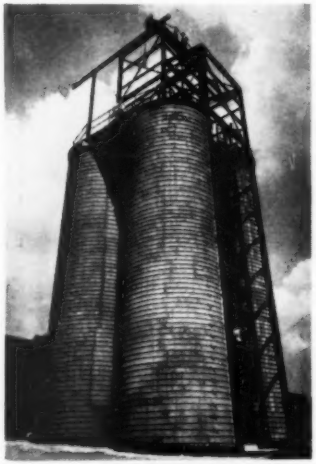
Silos Help Solve Industrial Dust Problem

Contributed by Westinghouse Elec. Corp.

FOUR HUGE silos loaded by a giant "vacuum cleaner" will shortly eliminate most of the dust and hand shoveling formerly associated with handling clays at our porcelain plant, Derry, Pa. Previous handling of these fine, dry powders had created difficult dust conditions because of their low moisture content. Workmen found facial respirators necessary. Unloading, storing, and utilizing these raw materials was a time-consuming operation involving hand shoveling and conveyor belts.

Four silos are being built, each 68 ft high and 14 ft in diameter. Of concrete-slab construction reinforced with iron bands, the four units will hold nearly 32 carloads of raw materials. Materials stored in the silos can be shaken out easily through trap doors into "weigh" cars and carried to mixing vats.

A big vacuum cleaner will load the silos from railroad cars. A 30-in. vacuum tank placed on top of the silos will have enough suction to draw the material up through a 6-in. tube and drop it into the silos. Formerly unloading a carload of such material meant 20 hr or more of shoveling. Now the workmen need only guide the suction nozzle through the material. In addition, respirators will no longer be needed.



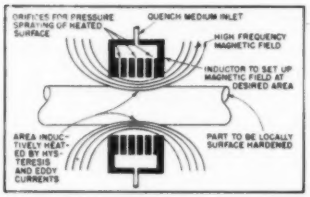
Four silos, capped by an outsize vacuum cleaner are used in the process of storing and handling clays for insulator manufacture

Surface Hardening by Industrial Heating

Submitted by J. D. Marlette

ONCE IN A GREAT while we have occasion to harden shafts and other steel parts in our maintenance shop. We would like to rig up hardening equipment to handle these odd jobs if it can be done in the shop without undue expense. Can you tell me how the equipment is used and give some basic information on the method?

SOME TIME ago a company in Ohio reported that it was making use of some home-made equipment for this purpose. It is understood, of course, that the grade of steel used must respond to rapid heating to the critical temperature, then quenching. This company reported that processes were developed whereby standard SAE steels as well as various cast materials were hardened by inductive heating methods.


ORIFICES FOR PRESSURE SPRAYING OF HEATED SURFACE
QUENCH MEDIUM INLET
HIGH FREQUENCY MAGNETIC FIELD
INDUCTOR TO SET UP MAGNETIC FIELD AT DESIRED AREA
AREA INDUCTIVELY HEATED BY HYSTERESIS AND EDDY CURRENTS
PART TO BE LOCALLY SURFACE HARDENED

Schematic diagram of surface hardening equipment shows principle of operation. Note the quench medium inlets and the orifices for spraying of heated parts

As shown in the diagram, the part to be locally surface hardened is placed within a wound coil or inductor carrying sufficient alternating current to heat that portion of the metal which is within the magnetic field of the inductor. By using sufficient power it requires only a few seconds to bring the surface zone up to critical temperature.

At the exact instant necessary, quenching of the heated zone is provided by pressure jets of cooling liquid ejected through orifices that are integral with the inductor block. This permits quenching without air cooling.

Fabric-Walled Welding Booth

Contributed by Tube Turns, Inc.

VINYL-COATED cloth woven of Fiberglas yarns is used for the four sides of a new welding booth in our main plant at Louisville, Kentucky.

The cloth is suspended by hooks from a rod frame made to the size of the work area. The cloth is hung in overlapping panels, and easily pushes aside at any point to permit the entrance or

(Continued on page 72)

MAXWELL MANNING & MOORE INC. M&M TRADE MARK

Chief Research Engineer Reports on Valve Trim Materials

"S" Monel consistently showed better anti-galling properties... than any of the other metals we have tested...

Albert D. Eplett

These are the words of Albert D. Eplett, chief research engineer of MANNING, MAXWELL & MOORE, INC., Bridgeport, Conn.

As a result of controlled laboratory tests made under his direction over a period of years, "S" Monel* is now standard material for guide sections in four types of Consolidated Safety Valves.

Here Mr. Eplett tells you about one of the actual tests:

"We carried out our anti-galling tests," he says, "by building a small valve identical to the larger ones ordinarily used. We devised a cam-operated mechanism that would give us lifting characteristics similar to those that occur with steam. Superheated air was carried in through the nozzle and up over the disc and guide portions, where we located thermocouples. When galling occurred, a cut-out device shut off the operating mechanism.

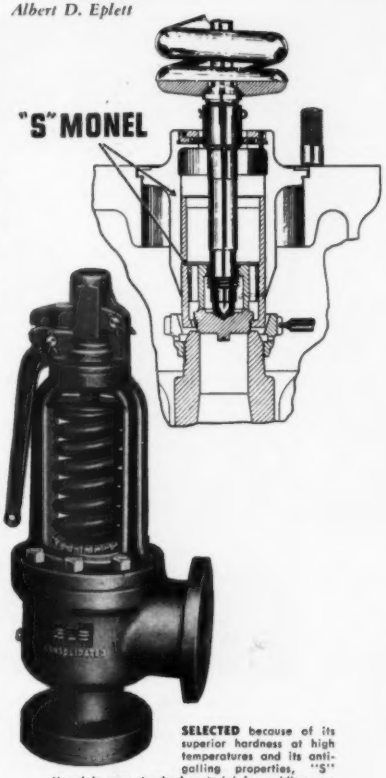
"By this method, we have tested a great number of valve trim materials, including the so-called super alloys. ***And we discovered that "S" Monel consistently showed better anti-galling properties in combinations with other metals and against itself than any of the other metals we have tested*** – excluding, of course, hard facing alloys, which are not as economical to use."

"S" Monel, in addition to its non-galling characteristics, has the well-known properties and advantages of *all* INCO Nickel Alloys. ***It is strong . . . tough . . . fatigue resistant . . . corrosion resistant.*** It simplifies fabrication and offers economies in valve trim for high temperature service; it is an outstandingly efficient material for heat-treated engine castings, hot air scoops, fuel line fittings, pump liners, fuel and oil tank flanges, wing hooks, etc.

DO THIS – NOW

Get more information about extra-hard heat-resistant "S" Monel and other specialized valve materials. Write to R. F. Johnson, c/o The International Nickel Company, and ask him to send you INCO's valuable booklet, ***Trimming Valve Costs with Lasting Trim.*** It tells you how to make valves last longer, whether they handle live steam, hot chemicals, compressed air or corrosive cooling water. Send today for your free copy. A post card will do.

*Reg. U. S. Pat. Off.



SELECTED because of its superior hardness at high temperatures and its anti-galling properties, "S" Monel is now standard material for guiding sections (arrows) in this Manning, Maxwell & Moore Consolidated Safety Valve. Used in the hardened state, the "S" Monel parts cast at Inco's foundry are given a ground finish with an emery cloth polish prior to assembly.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

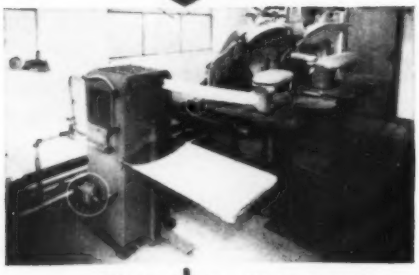
EMBLEM OF SERVICE
NICKEL INCO ALLOYS
MONEL* • "K"* MONEL • "S"* MONEL • "R"* MONEL • "KR"* MONEL
INCONEL* • NICKEL • "L"* NICKEL • PERMANICKEL* • DURANICKEL* • INCONEL "X"*
*Reg. U. S. Pat. Off.

"How to get new steam traps for free"

Trade steam losses for them . . .

Cost of Steam Leaks at 100 Pounds Pressure
(Assuming steam costs 50 cents per 1000 lbs.)

Size of Orifice	Lbs. Steam Wasted Per Month	Total Cost Per Month	Total Cost Per Year
1/2"	835,000	$417.50	$5,010.00
3/8"	470,000	235.00	2,820.00
1/4"	210,000	105.00	1,260.00
1/8"	52,500	26.25	315.00
1/16"	13,200	6.60	79.20
1/32"	3,400	1.70	20.40



Saves $59.62 MONTHLY — $98 for Armstrong Steam Traps cut the fuel oil consumption at Wisconsin Cleaners, Milwaukee, from an average of 1167 gallons per month down to an average of 625 gallons per month. The traps were better than "for free" — they pay back their purchase price more than seven times every year!

IT COSTS far more to live with leaky steam traps than it does to replace them with Armstrongs — the traps that pass no steam. Measure their cost against steam losses caused by traps that let steam get by (see left).

In Armstrong traps the discharge valve is water-sealed at all times—no steam gets to it. There's no chance for dirt to hold the valve open and let steam escape. Armstrong traps don't COST money, they SAVE money. Ask your nearby Armstrong representative to figure on the traps you need now.

ARMSTRONG MACHINE WORKS
912 Maple St., Three Rivers, Mich.

SEND FOR THE STEAM TRAP BOOK. It tells how to figure condensate loads, how to select traps. Includes prices, data, capacities of Armstrong Steam Traps. Write for your copy.

ARMSTRONG STEAM TRAPS

Plangineering

Have you recently licked a tough problem in your plant with a method that called for planning, ingenuity and engineering? That's Plangineering! Send photos and information to Plant Engineering, 53 West Jackson Blvd., Chicago 4, Ill. The editors will pay $10 for any item accepted from a reader. Manufacturers note: Plangineering welcomes photos appropriate to this page.

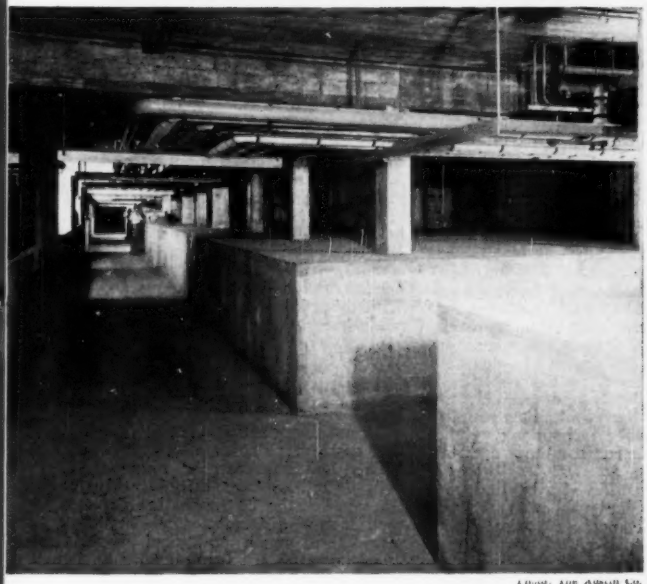
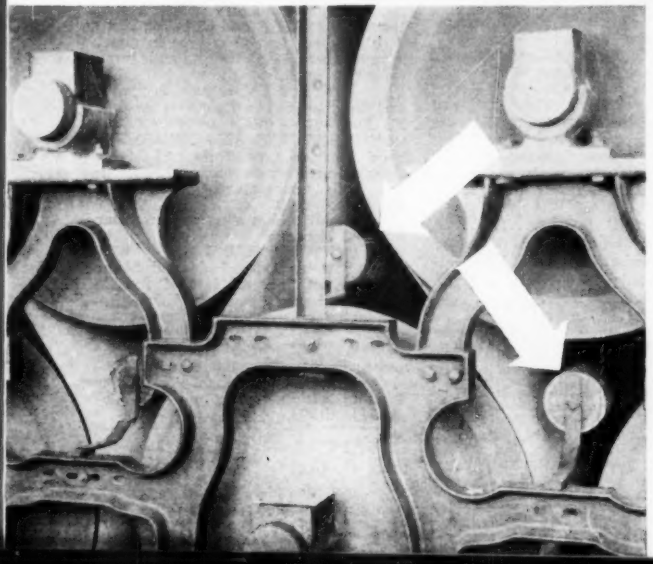


Photo: The Austin Co.

● **Pipefitter's Dream**—Pipe lines for essential utility services in Shell Oil's new product quality control laboratory at the Deer Park Refinery, near Houston, are installed in this concrete trench basement with low head room. Piping is mounted on trapeze hangers to facilitate maintenance and to provide flexibility of distribution. Lines run the entire length of the building, so that branches may be brought up through the floor wherever future requirements dictate. Distilled water is carried in an aluminum alloy pipe with a high percentage of pure aluminum to prevent contamination.



● **Lineman, Spare That Tree**—Excessive trimming of trees by telephone linemen is eliminated by use of a new spiral guard of Tenite plastic. Drop wires may be threaded through, or the guard may be wound on spirally. Guards extend three feet beyond tree limits to allow for growth of branches. Also used where wires over tree tops have less than two years' clearance.

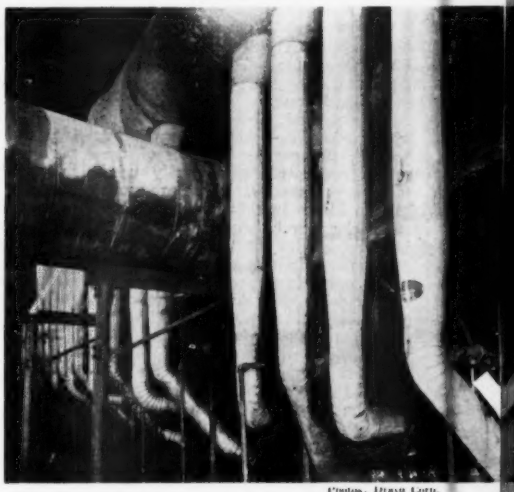


Photo: Durho Corp.

● **Operation Rejuvenation**—A 50-year-old paper making machine was recently stepped up 10 per cent in capacity to meet increased demand for products of Durham Paper Board Co., Riegelsville, Pa., at a time when new machinery was not available. The "rejuvenation" of the machine was a typical Plangineering project. Drying was the bottleneck. Paper board enters the drier section at about 40 per cent moisture content, travels over 35 revolving steam drums and is dried to six per cent. Drying was speeded up by discharging large volumes of warm air at high velocity through perforated tubes that run longitudinally between the drying drums. Moist air is carried off by three 48-in. exhaust fans in a hood covering the drier section. The photo above shows the main warm-air duct from the heater, which runs the length of the drier, tapering from 30 in. to 20 in. and carrying over 17,000 cfm of warm air. Eighteen 8-in. branch ducts lead from the main to 5-in. perforated tubes, 70 in. long, placed between the steam drums of the drier.

At the left, a close-up of a section of the drier shows the ends of the 5-in. perforated tubes, placed to discharge warm air close against the moving web of moist paper as it travels over the steam drums. Perforations are spaced about an inch apart in rows along three sides of each tube. This simple system enables the drier to operate at a 10 per cent increase in capacity.

Heat Conservation as the Plant Engineer Directs It

How to uncover hidden losses in heating systems by metering, instrumentation and good operating procedures . . . Details of practice of Boeing, where in cold weather steam consumption runs 111,000 lb per hr at an appproximate cost of $110 per hr or $315,000 per year . . . In the factory, building exhaust systems move 2,000,000 cfm . . . Use of the degree day . . . Causes of irregularities . . . Instruments required

By R. J. HIGMAN, Plant Engineer and Wm. B. PRIDE, Heating & Ventilating Engineer, Boeing Aircraft Co., Seattle, Wash.

FUEL CONSERVATION, during these days of high operating costs and frequently scarce fuel supplies, is good business. Every plant should stretch available supplies to insure continued production without costly shutdown periods. We will show how this is done by some plant operators with gratifying results.

The Problem: We will not discuss boiler operation or efficiency as such but will assume that: 1, the heat generator or source, whatever it may be, is operating efficiently; 2, steam is used since the examples are worked out for this medium; and, 3, the greater portion of the steam generated is generally used for comfort heating. There are more hidden losses in this portion of the steam load and these losses should be eliminated.

Metering: In setting up a permanent operating procedure, steam consumption should be metered. There are a number of different makes and types of meters, some of which meter the condensate, others meter the steam. The purchase and installation costs of meters can rapidly be amortized from resultant fuel economy. In some cases we make a few piping changes to eliminate process steam and hot water heaters from our comfort steam metering systems. This is recognized standard practice largely for reasons of economy and control due to the different seasonal demands of comfort heating and other steam loads.

If these piping changes appear too extensive for immediate rework we make it a long term job, and in the meantime, for purposes of analysis, estimate and deduct this consumption from the comfort heating load. Quite often, a good fuel economy program is a long-term operation, running 2 or 3 yr before maximum savings can be shown. In this case it is best to pick up the major savings immediately and use all, or a portion of, the resultant savings to finance further refinements, piping changes, instrumentation, controls, etc.

One case study of a method used with good results where there was considerable process steam piping connected with comfort steam piping, follows: We purchased two meters and several different sized orifices to give sufficient accuracy and range to meter almost any flow condition from zero to an estimated maximum.

These two meters installed temporarily on the various process lines made it possible to determine average, maximum and minimum steam consumptions for various processes. Apart from the question under discussion, these steam meters can be used to very good advantage for studying steam loads under varied conditions, for trouble shooting, and, for determining the limitations of piping with regard to future loads.

Checking Results: For comparing heating results and effecting economical operation we use the old and recognized method, the degree-day, for convenience referred to as DD. With this base one can compare the heating costs of one building with another, or, determine approximate future consumption. We are concerned primarily with the number of degree-days per day, which for a given day, equals 65 F. minus the daily mean outside temperature for that day times one day.

This DD data can be obtained daily from the local U.S. Weather Bureau, but the U. S. Weather Bureau Monthly Meteorological Summary gives much additional data which can be used to advantage. With consumption established on a 24 hr. DD basis, we are using a

Table I. Typical operating schedule for a specific building, the cafeteria, an interior view of which is shown by Fig. 2. Electric clocks do most of the work. These clocks are equipped with varying numbers of "off" and "on" levers including week-end and holiday advance "cut on" provisions. The "on" and "off" schedules are varied with the seasons and with outside temperature changes

Operation Number	Control	Weekday Operations—Except Following A Holiday	Operating Schedule—Following A Holiday
1	BHMV	On days before holidays	.....
		Shut off at 12:00 Midnight	.....
2	BHMV*	.....	Turn on at 12:00 Midnight
3	BHVM	DRCH on at 6:00 AM***	Comfort Heat on at 12:00
4	FRCC**	DRCH off at 4:00 PM	Midnight
5	FRCC	DRCH on at 6:30 PM	.....
6	FRCC	DRCH off at 9:00 PM	.....

BHMV*—Main Steam Control Valve, serving entire steam service to Cafeteria. This valve is located in the North Boiler House and will be operated by the Operating Engineer on duty.

FRCC**—Fan Room Clock Control. This Clock will shut off the main supply air fan, located in the basement fan room, which automatically cuts off all steam on the dining room supply air system.

DRCH***—Dining Room Comfort Heat. For unusual operations necessitating overtime operation of Cafeteria (Special Meetings, Plant overtime, etc.) Dept. 434 will be responsible for furnishing operating schedules.

Table II. Some Instrument and Test equipment essential to an effective heating system control and operation

THERMOMETERS

(a) Portable type, 7 da and 24 hr graphic types with several feet of capillary tubing and an immersion bulb. Range, 20 to 120 F and 50 to 350 F.

(b) Etched stem glass type in metal armor case, 12 in. length, and three ranges covering from minus 40 to 400 F.

(c) Etched stem glass type, in pocket carrying case, 5½ in. length, range 0 to 220 F.

TEMPERATURES AND HUMIDITY

(a) Portable type, 7 da and 24 hr, thermo-humidigraph reading directly in dry bulb temperature and relative humidity.

(b) Small pocket sling psychrometer for spot checks.

PRESSURE

(a) Portable type, 7 da and 24 hr graphic, with several feet of flexible tubing and gauge snubber. Range dependent upon demands.

AIR MOVEMENT

(a) Velometer with attachments for measuring air flow and direction.

(b) Aspirator and smoke tubes for locating sources and nature of objectionable drafts.

recognized standard which permits checking results with other operations, locally and elsewhere. This, however, means reading steam meters once every 24 hr.

In order to utilize the standard comparison check we calculate, for records purposes, the use in pounds of steam consumed per DD per thousand cubic feet of building volume. A check of statistics compiled by the ASH&VE, the National Association of Building Owners and Managers and other available sources indicates that our office building should, for comfort heat, consume somewhere between 0.3 and 0.7 lb of steam per DD per M cu ft of building volume.

Degree-Day Curve Analysis: Top management is primarily concerned with the final dollars and cents cost and its relation to steam savings. Much research expense and large capital expenditures have gone into the study and operation of steam generating plants in order to reach peak efficiency. In many cases a greater savings can be realized, generally with a minimum expenditure, in the field of controlled steam usage. The daily DD curves tell at a glance the comparable efficiency of the operation and its operating personnel.

The operating staff finds this simplified system helps analyze daily progress and maintain peak efficiency without voluminous records, charts and calculations. The personnel also realize that the control and operating methods used today, determines what will be plotted on the curve tomorrow and will also immediately expose leaks, faulty traps, etc.

Irregularities in Steam Consumption: Once the consumption has been established in pounds per DD per M cu ft the factor should remain reasonably constant. Theoretically it would plot as a straight line but occasional humps and dips will appear. The cause for these may be one or more of the following:

1. **When operating under outside temperatures that place minimum demands upon the heating system.**
2. **When operating during minimum outside temperatures and maximum DD.**
3. **When operating with wind velocities in excess of 15 mph. Some utility companies add one DD for each 5 mph of wind velocity.**
4. **With longer than normal hours of occupancy, or, on days following a holiday shutdown.**

Experience with, and use of, the curves will soon clarify these abnormal conditions, which actually level out quite well over a period of a month or more.

Establishing the Heating Hours: Each operation requires individual analysis to establish necessary heating time. Graphic thermometers, investigation of comfort conditions, hours, and nature of occupancy will determine the "heating up time" and operating schedule to be followed. Some of the points to be watched by the operating staff are as follows:

1. **Windows: Are the occupants controlling and wasting heat by opening and closing windows?**
2. **Individual convectors: Are the occupants controlling these? If so, probably they leave them off at night and then complain of lack of heat upon arrival next morning.**
3. **Overheating in some locations: Is this due to localized trouble in other locations? Such local trouble should be corrected rather than overheat the entire structure to satisfy one area.**

Instruments for Fuel Conservation: Instrumentation is a profitable investment, the size and extent of which will depend upon the operations involved. Instruments are valuable to the operator for: they enable him to acquire an intimate knowledge of the system under his control; facilitate trouble analysis; and, generally stimulate a personal interest in improving operating efficiency. We consider the instruments listed in table III essential in our operation. We believe that graphic instruments bring profitable results only when used constantly.

Identifying Valves and Controls: We at Boeing use stamped metal tags for permanent identification of all valves, switches, thermostats and controls necessary for the operation and maintenance of the heating system. We attach, with our operating schedule, a complete list of these items and their locations. We also

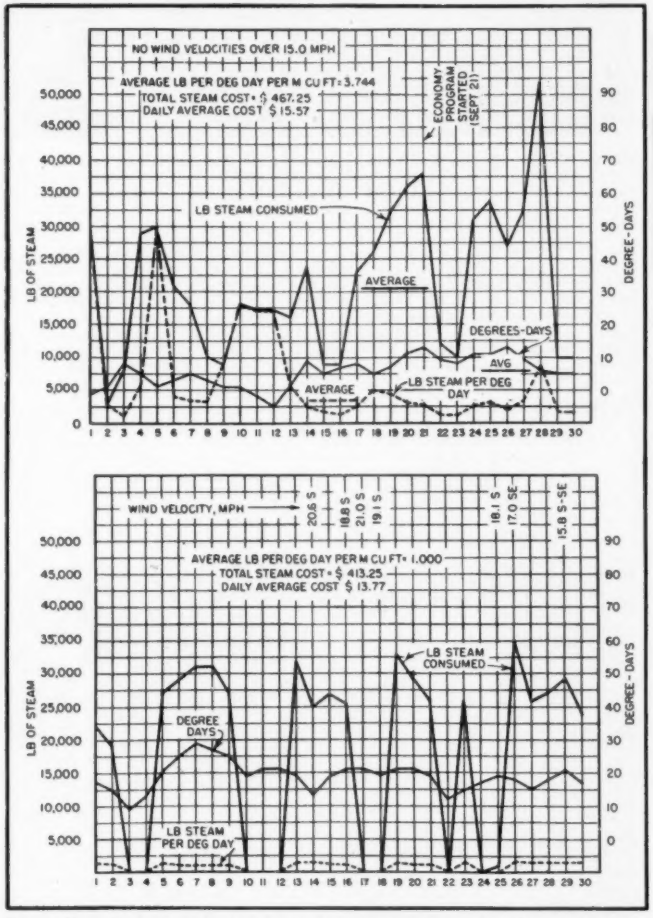


Fig. 1. Two charts for a typical fall and winter month for the cafeteria building. Consumption figures cover gross steam, a sizable portion of which is used for cooking, dishwashing and water heating. Peak steam consumption for Boeing Plant runs to 110,000 lb in cold weather. For January, 1949, the steam cost approximated $54,000, and for the year of 1948 some $315,000. For the same 12 mo. the fuel oil consumption was 2,907,240 gal equivalent to a single tank train 2 mi long. Lower than average temperatures in 1948 boosted the fuel consumption by 20 per cent

Fig. 2. (Above) Boeing Cafeteria looking toward east wall. This cafeteria seats about 2000 and is heated by forced hot air with a gentle air movement from south to north (entrance doors are in south wall, kitchen on the north wall) with some air being exhausted through visible overhead grilles in north wall and the balance passing into the kitchen to maintain a negative pressure in the kitchen

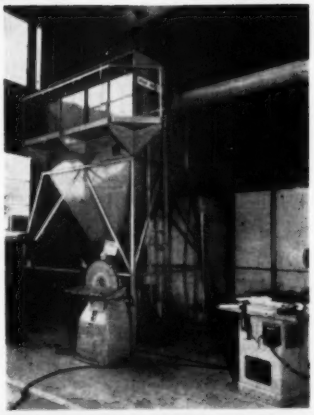
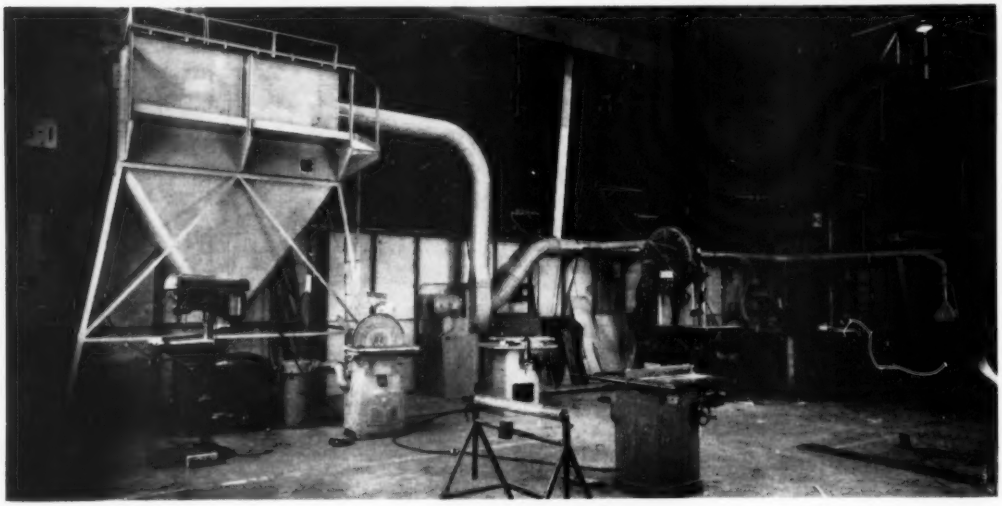


Fig. 3. (Right) This and Fig. 4 show a recent installation in one of the smaller Boeing shops to utilize or save heated air that would normally be exhausted. Sawdust is deposited in hopper due to the large expansion chamber and consequent low velocities. Air is passed through the filter media and passes out of the three visible openings on top of the unit. Note the convenient access ladder and catwalk for filter inspection and servicing. The draft gauge, visible almost directly below the inlet pipe, determines the condition of the filter media, with new media it reads about 0.8 in. w.g. and increases as the filter is loaded. Manual shakedown every 24 hr vibrates the media and remove much of the fine sawdust

Fig. 4. (Below) Prior to shakedown the draft gauge may read anywhere up to 3 in., after shakedown the resistance drops considerably. When the draft gage finally will not shake down below 3 in. w.g. the filter media is renewed. Note the Plexiglas peep-hole directly under the catwalk; this serves a dual purpose, it is excellent for observing the action within the unit and it is a positive check to insure the hopper will not get too full before being emptied. Notice that the entire installation is designed and installed with provisions for moving and relocating with minimum effort, an important feature where changing operations with consequent installation of new machinery make flexibility an essential feature



provide a copy set up in a permanent manner or frame in the mechanical room of the building in question.

The Operating Schedule: A separate operating schedule is drawn up for each building. This schedule, when completed is permanent, except of course, for changes, modifications, holiday interruptions, etc. The schedule clearly indicates the approximate time each operation should be performed under the entire range of outside and inside temperature conditions. From it, the operator determines: 1, turning on time; 2, necessary daily follow-up and operating procedure; and 3, turning off time. A copy of this schedule plus the previously noted location schedule, is given to the operator. A duplicate copy is also set up in a permanent manner in the mechanical room of the building to which it applies.

With simplicity and proper forethought we aim to draft operating procedure in such a manner as to be readily interpreted by anyone with the minimum of training. We also coordinate the procedure with our maintenance servicing schedules on traps, fans, filters, etc. to insure, in so far as possible, that all equipment will operate properly when needed. The system in its entirety is quite easy to control since it all comes under the jurisdiction of the plant engineer.

Additional Savings: There are many steam saving methods which depend largely upon the nature of the operation and equipment involved. Some of the more general are noted below. The manner in which these are accomplished will show up on DD records.

1. **Proper maintenance of steam traps as indicated by the use of immersion thermometers, pressure gauges and feel, and much of which may be done without removal of traps for special test.**

2. **Adequate insulation of the structure, pipe lines and equipment.**

3. **Proper application of heating units, considering the temperature of the steam, height of discharge, etc.**

4. **Fullest utilization of heated air (on hot air jobs) recirculating as much as possible and still maintaining healthful conditions. In some cases this may mean the use of secondary filtration an after cleaner or activated carbon for odor removal.**

5. **Utilization of preheaters and economizers where large amounts of heat from any source may be being discharged to the outside atmosphere.**

6. **Intelligent design and application of exhaust systems where used to remove some solid waste material or objectionable gases. This means providing minimum air removal to accomplish the job at hand.**

Net Results: Dividends accrued; eliminate chance of heating system not being turned on or off in event of unforeseen accident; and labor turnover, can educate new personnel in record time.

Table III. Operating schedule for the Engineering Building. Instructions of this type are set up to assist untrained operators to interpret the schedule by reference to metal tags, numbered and attached to the various valves, switches, etc. Until schedule is changed, it is used on operations where a variable schedule is set up and timing of the various operations in accordance with the season and outside temperatures. At Boeing Aircraft Co., Seattle, the Plant Engineering Dept. advise operators in the Maintenance Dept. as to schedule changes

Control operating procedure for all steam heating and ventilating equipment	
1. Mon., Tue., Wed., Thur., and Fri. at all outside temperatures (until schedule is changed) 5:00 AM	Open hand valve No. 3 and observe nearby steam gauge for results; it should read between 0.5 and 5 lb pressure. (Located at foot of access ladder to Engineering Building Fan Rooms). Set Automatic Vacuum Switch No. 3A on Position No. 1—vacuum on, float on; check to see that vacuum pump starts and compound gauge should read about 10 in. of vacuum at the end of cycle. (This switch is located on the vacuum pump in Tunnel J).
2. Mon., Tue., Wed., Thur., and Fri. 8:00 AM at outside temperatures up to 65 F. For outside temperatures above 65 F use procedure No. 3 instead of this procedure No. 2.	Open hand valves No. 4 and No. 4A. Start fan with push button switch No. 4B. Start exhaust fan with push button switch No. 4C. Observe both of these fans to be sure they are running. (Controls No. 4, 4A, 4B, and 4C are all located on the lower deck of the Engineering Building Fan Rooms). Open hand valve No. 4D. Start supply fan with push button switch No. 4E. Observe fan to be sure it is running. Close precipitron safety switch No. 4F and check pilot lights on each Precipitron Unit (if the units are functioning the green pilot light will be on, if they are not functioning properly the red light will be on or there will be no light on. In the event that any of the units are not functioning, the Electrical Maintenance Department should be advised. Note—these Precipitron Units will not function until all four doors to the tempered air plenum chamber are locked closed and all four safety switches on the inside above these doors are in the closed position.
3. Mon., Tue., Wed., Thur., and Fri. (For all outside temperatures above 65 F) 8:00 AM	Start fan with push button switch No. 4B. Start exhaust fan with push button switch No. 4C. Start supply fan with push button switch No. 4E. Close Precipitron Safety Switch No. 4F.
4. Mon., Tue., Wed., Thur., and Fri. at all outside temperatures (until schedule is changed) between 3:30 and 4:30 PM	Close hand valve No. 4 & 4A. Stop fan with push button switch No. 4B. Stop exhaust fan with push button switch No. 4C. Close hand valve 4D. Stop supply fan with push button switch No. 4E. Open Precipitron Safety Switch No. 4F.
5. Mon., Tue., Wed., Thur., and Fri. at all outside temperatures (until schedule is changed) Between 5:00 and 6:00 PM	Close hand valve No. 3. Set Automatic Vacuum Switch on Position No. 2—vacuum off, float on.

NOTE: Procedures No. 1 to No. 5 accomplish the following: At 5:00 AM the radiation in the building is turned on. At 8:00 AM the ventilating system and its heating units are turned on.

At 4:00 PM the ventilating system and its heating units are turned off and at 5:30 PM the radiation is shut off. There is no heat on in this building between 5:30 PM and 5:00 AM

DAILY OPERATIONS: The only control on the radiation in this building is a pressure reducing valve on the steam main which maintains a constant pressure until such time as a change is made (manually) in the valve setting. There are thermometers located on second, third, and fourth floors on the front of thermostats. The room temperature which these thermometers register is dependent upon heat from radiation as well as heat from the ventilating system. Periodic checks should be made of these thermometer readings.

The tempered air temperature for the second, third, and fourth floors is controlled by a Johnson thermostat located in the tempered air plenum chamber on the upper deck of the Engineering Building Fan Room. There is also a thermometer at this location, however, the tempered air temperature should be determined from the following locations: For the second floor there is an insertion thermometer located in the duct and visible from outside the lower deck fan room, for the third and fourth floors there is an insertion thermometer located in the duct and visible from outside the upper deck fan room. This tempered air temperature should run between 60 and 65 F.

The outside air temperatures can be checked from two locations on the upper deck of the fan room; one thermometer is located adjacent to the west outside air supply grille and one is located to the north outside air supply grille. The readings of these two will vary, dependent upon the weather, however, an average temperature may be assumed.

There is a pressure gage on the air supply which controls the various Johnson valves, this gauge should read about 15 lb and should be checked periodically.

The two air washers will not be used until this schedule is changed; consequently, the pumps, water, and steam for humidifying will not be turned on.

After turning ventilating equipment off, check Johnson valves No. 4H and 4I and make sure no steam is passing through them. These Johnson valves will automatically close when the ventilating supply fans are shut off (providing they are functioning properly).

Procedure for controlling heating and ventilating equipment on the ground floor has been omitted, because of controlling facilities which have yet to be installed.

This X-ray machine, being used to inspect the weld of a large propane tank, is a potential source of dangerous stray radiation. The hygienist at the left is measuring the level of x-ray radiation intensity in the working area

How Bethlehem Cuts Potential Hazards

Hygiene technicians are constantly "all over the plant" at Bethlehem Steel Co., using portable instruments to detect possible sources of danger to the health of workers

Left: A direct-reading benzol indicator being operated on a tank car of crude benzol. The instrument tells at a glance the concentration of benzol fumes in the working area. These fumes are toxic, and can be very dangerous

Below: Human nerves can stand only so much noise without serious consequences. The hygienist is using a sound level meter to measure the noise of the chipping hammer the workman is using

Right: Sampling dust concentrations. Operator at Bethlehem plant holds a large impinger, or sampling tube, powered by a portable electric pump, close to the swing-frame grinder which the workman is using. An atmospheric sample is drawn into the impinger and caught in a vial of alcohol. From this alcohol are taken samples for dust counting on the screen of the laboratory microprojector

Paints and Painting
For Buildings and Equipment

Reasons for and methods of surface preparation . . . Scheduling of painting . . . Importance of film thickness in various atmospheres . . . Types of protective coatings, their makeup and characteristics . . . Comparative values of various paints as primers, protective coatings . . . Protecting corrugated sheeting, factors affecting its serviceability

By W. W. SCHERER,* Division Supt. of Maintenance
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IN THE APPLICATION of paints, experience has shown that certain fundamental requirements must be adhered to if satisfactory performance is to be obtained: These are: 1. The preparation of surface; 2. application of coating under proper conditions; 3. adequate film thickness; 4. selection of material.

The Preparation of Surface

The success or failure of any paint job starts with surface preparation. To obtain a satisfactory bond between surface and paint it is necessary that the paint make intimate and complete contact with the surface. It is obvious that any foreign substance such as rust, loose scale, old loose paint, dirt, grease, oil film, moisture, acid or alkali, even though this substance may be invisible, separates the paint from the steel. The practice of painting over tightly adhering mill scale is generally considered acceptable when priming structural materials.

Because of the importance of surface preparation, the subject has been given considerable attention so that quite a number of methods have been developed. These include mechanical methods such as wiping, manual and powered wire brushing, scraping, manual and pneumatic chipping, and sand, shot or grit blasting; chemical methods such as application of volatile organic solvents, hot caustic solution or acids, and finally a thermal method using an oxy-acetylene flame.[1] This latter method will remove rust and loose scale effectively and has the additional advantage that it drives moisture from the surface; that is, dehydrates it. The use of compressed air, water or steam will be advantageous in certain instances. In using chemical solvents, it is essential that all traces of the solvent or residues be removed before painting. Irrespective of the method employed, its effectiveness will be in proportion to the thoroughness of the operation.

A priming coat should be applied as soon as possible after the surface is prepared. Also, successive coats should be applied as soon as practicable after drying of the preceding coat. In extremely unfavorable locations, with heavy concentrations of chemical contaminants, it is advisable to schedule maintenance painting to correspond with periods of suspended operations in the producing unit if at all practicable. Thorough mixing of the pigment and vehicle at the time of painting is, of course, to be observed. Mechanical stirring is recommended when paint is mixed in drum lots.

Adequate Film Thickness

If a surface is properly prepared and a quality paint applied under satisfactory conditions, the protective value of the coating will depend largely upon the thickness of the film. To a certain degree paint films are permeable to moisture and gases and as film thickness decreases, permeability increases disproportionately in the range of thicknesses normally applied.

A minimum of three coats is usually recommended for new work, a single shop priming coat and two coats after erection; also, repainting may be conducted on a single coat basis except where individual areas have rusted. After preparation, it is advisable to apply two undercoats to such areas before finishing.

Numerous structures have been erected for service which were given a single shop priming coat and a single finish coating after erection. Where conditions are favorable, such as those existing in interiors of buildings that are warm and dry so that moisture does not condense on the structure, such a program may be defensible and a long time protection assured. However, there are other interiors or localized areas of interiors where, for example, moisture from products of combustion may collect and, consequently, even a three-coat job will not stand up as well as the two-coat job under more favorable conditions.

It is well not to be dogmatic on the subject of the optimum number of coats. Other factors may influence decisions; for example, the anticipated permanence of the structure, decorative considerations and the degree of importance of permanent, 100 per cent protection. There is one advantage of a three-coat system, however, which should be recognized. The use of different color pigmentation for different coats not only assists in assuring adequate coverage but also serves as a device to warn that prompt repainting is necessary if extensive surface preparation is to be avoided.

Selection of Paints

Paints may be classified as follows: 1. Oil and Pigment Paints including long-oil synthetics; 2. Varnish and Pigment Paints, including short-oil synthetics, which can be called Enamels; 3. Pitch Paints which are solutions of pitch such as coal tar and asphaltum in a volatile solvent such as mineral spirits, turpentine, or coal tar light oil; 4. Lacquers which are combinations of nitrocellulose solutions, plasticizers, resins, and coloring matter; 5. Water Paints, which are combinations of various glues, whiting, and color pigments, and, more recently, resin emulsions with water.

Lacquers are of very little interest in plant maintenance work because they contain approximately 75 per cent volatile matter and require application in numerous coats under most favorable conditions to produce desirable results.

Water paints are recommended for application on acoustical material surfaces in offices, otherwise they, too, have little significance here.

Oil paints adhere to steel surfaces better than do the enamels, which is one of the reasons for their continued importance as primers especially for exterior structures.

The standard vehicle in oil paints is linseed oil and the pigments in general use are red lead, lead chromate, blue lead, zinc oxide, zinc chromate, titanium dioxide, iron oxide, graphite and lampblack with or without filler such as asbestine (magnesium silicate) silica, china clay and whiting.

Red lead, blue lead, and zinc oxide are basic pigments and react with linseed oil to form metallic soaps

[1] For details of oxy-acetylene method of surface preparation see article "Before Painting Metal, Condition It With a Flame," September, 1948 issue, PLANT ENGINEERING.

called linoleates. Titanium dioxide, iron oxide, graphite and lampblack are inert and therefore do not react with linseed oil. The lead and zinc oxide paints containing the metallic soaps form dense films and are more water resistant than paints produced with linseed oil and inert pigments.

Red lead and linseed oil paint has the adhering qualities of linseed oil paint with the added water resisting quality of the metallic soap formed in the paint coat as well as certain rust inhibitive qualities due to its chemical composition. It is highly recommended as a primer where moisture and corrosive conditions are severe.

Iron oxide finish coats have been proven over many years of service to produce a very durable paint in the weather and have been used successfully as a primer where the moisture and corrosive conditions are not extreme. Frequently lampblack is added to produce a distinctive color and to increase durability. The darker a paint, the more resistant it is to deterioration by the sun's rays.

The carbon pigments, graphite and lampblack, are inert and form extremely soft coats with linseed oil with comparatively little water resistance and no chemical rust inhibitive qualities. Therefore, they are not adaptable for primers but are durable as finishing coats in the weather. Much better moisture impermeability can be secured with these carbon pigment paints when a long-oil synthetic vehicle is substituted for linseed oil.

Aluminum pigment is very durable and when used with a suitable vehicle is recommended for finishing coats. It is not recommended as a primer.

The basic function of a primer is to protect steel from corrosion. Red lead in linseed oil is the most commonly used primer but is characterized by slow drying and relatively poor impermeability until the film has thoroughly oxidized. It is possible to hasten the drying cycle by the substitution of boiled linseed oil or long-oil alkyd resin for a portion of the raw oil, at no sacrifice in durability. Oil varnishes have sometimes been employed for the same purpose at a slight sacrifice in durability when unprotected by top coats.

Combinations of red lead and iron oxide have proven very satisfactory, particularly from the standpoint of durability when unprotected by top coats. Zinc chromate, usually in combination with iron oxide, provides a satisfactory primer at considerable saving over lead primers in the current market. It offers some advantage over a lead primer in freedom from toxic fumes where structural components are assembled by welding. Zinc chromate is more soluble than red lead and is therefore not recommended under conditions of extreme moisture except when dispersed in a vehicle of high moisture impedance such as a phenolic resin.

The primary function of the finish coats is to protect the primer and to provide decorative value to the structure. A properly formulated finish coat combines pigments of known durability which provide long term protection without cracking, fading, or excessive chalking. The vehicle for exterior finish coats for wood is usually linseed oil. For exterior steel, however, the harder finish which can be secured by the admixture of an oil varnish, or the use of a properly formulated alkyd resin vehicle will develop better resistance to moisture passage and therefore provide better protection for the primer.

For mill or shop interiors, where color or sustained appearance is a consideration, hard drying enamels are preferred, from the standpoint of variety of selection, drying time, and ease of cleaning. For relatively clean areas, such as offices and machine shops, the use of an eggshell or semi-gloss finish provides better light diffusion. Gloss finishes are preferred for dadoes and areas where air borne dirt is prevalent.

For normal interior exposure, the product which combines the optimum qualities of resistance to dirt collection, ease of cleaning, and color and gloss retention should be selected. For unusual conditions such as acid, alkali, oil and grease resistance, special finishes may be required which might include some sacrifice of otherwise desirable properties in order to provide resistance to the particular environment or service conditions. The vinyl compositions are highly recommended for their resistance to the attack of acid but do not possess a degree of adhesion so that special surface preparation such as sand blasting is required if they are to be used successfully. The phenolic resins have better adhesion with a slight sacrifice in acid resistance and continue to be used in large quantities.

The asphaltum and coal tar pitch paints possess a good degree of resistance to the attack of acids when applied in sufficiently heavy coats. They have, among other disadvantages poor light reflective value and are generally not used where a pigment and vehicle paint is satisfactory. They are frequently used, for example, in pickle houses, metal roofs and on surfaces of items buried underground, such as pipes. Some compositions include asbestos fiber to improve the structural stability of the coating over a wider range of temperatures.

Straight pitch materials, applied hot by mopping, have been used to extend the life of corrugated roofs which have begun to deteriorate. One method is to sandwich a material such as felt or canvas between two such coats taking necessary precautions to insure that the material conforms to the corrugations and is in actual contact with the first applied coat.

There is a special paint on the market which is fire protective to a degree when applied to wood or other combustible material. When flame impinges on the coating, large, cohesive blisters form, thereby insulating the underlying material from the flame.

Corrugated Sheeting

The protection of corrugated sheeting is a large item in the maintenance of the average plant building. Because it is so thin in comparison with other structural members, its life is relatively short once corrosion begins.

After erection, it is impossible to repaint the overlapped areas and frequently impractical to paint the underside of roofs. Any moisture penetrating the areas between overlapped sheets is likely to be trapped, and these areas are thus exposed to the influence of moisture over longer periods than the remainder of the surfaces. In buildings where moisture condenses on the inside surfaces, the protruding upped edge of the overlapped sheet will tend to favor the retension of condensate. Sheets on roofs frequently corrode through from the underside along this edge, the first indication of attack being a series of pin holes through the metal and an otherwise sound layer of exterior paint.

For these reasons, the many factors contributing to the serviceability of corrugated sheeting have been the subject of numerous individual investigations. The following generalized statements appear to be warranted if maximum service is to be obtained: 1. Mill scale should be removed from sheets before painting; 2. Pickling, washing, priming and baking of sheets provides an excellent foundation for finishing coats; 3. Little, if any, additional benefit is to be obtained by the use of rust inhibitive washes after pickling except insofar as they afford additional protection by enhancing the corrosion resistance of the metal. They may be beneficial if it is necessary to delay painting after pickling; 4. If galvanized sheets are used, satisfactory adhesion may be obtained by permitting them to weather, treating chemically, or by using a special zinc dust—zinc oxide primer before finishing coats are applied; 5. The heavier protective films possess much better durability. As lapped areas cannot be painted after erection, and as they may be subject to more severe corrosive influence than the remainder of the sheet, it is advisable to give them an extra coat, or coats, before erection; 6. Handle sheets with care.

*This article was presented, October 5, at the meeting of the Association of Iron & Steel Engineers, in Pittsburgh, and is abstracted here with permission of the Association.

How to Choose Centrifugal Pump Materials That Can Take It

Part I . . . Analysis of centrifugal pumps by parts . . . Materials commonly used under various conditions . . . Materials used in standard, all-iron, all-bronze pump fittings . . . Salt water pump materials

By **IGOR J. KARASSIK** and **ROY CARTER***
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THE CONDITIONS of service and the nature of the liquid to be handled determine the most satisfactory materials to be used in the construction of centrifugal pumps. Some of the factors which enter into the selection of the most suitable materials are:

1. **Abrasiveness of suspended solids.**
2. **Corrosion resistance.**
3. **Electrochemical action.**
4. **Pumping temperature.**
5. **Head per stage (as it affects both the impeller peripheral velocity and the liquid velocities in the waterways).**
6. **Operating pressure.**
7. **Suitability of the material to the structural features of the particular pump involved.**
8. **Load factor and expected duration of the pumping installation.**

It must be noted that centrifugal pumps can be manufactured of almost all the known common metals or metal alloys, as well as of porcelain, glass and even synthetics. At the same time, it is not intended to present here a listing of all the liquids which may be encountered in centrifugal pump applications and a corresponding tabulation of the materials commonly recommended for each of these liquids. Such a listing can be readily found in the Standards published by the Hydraulic Institute,* as well as in the catalogs and bulletins of pump manufacturers. A very detailed presentation of recommended materials can be obtained specifically from those manufacturers who specialize in centrifugal pumping equipment for various chemical services, for it is in this latter application that one can find the greatest variety of very special problems. Instead, this series of two articles will be directed towards presenting a general picture of the considerations which need be given to a variety of factors in the evaluation of this or that material for use in this or that part of a centrifugal pump.

Our first analysis will thus concern itself with the separate parts which comprise a centrifugal pump and with the materials most commonly used for each of these parts.

Pump Casings. Centrifugal pump casings are usually made of cast iron. For some services, alloy irons may be desirable to provide a more refined crystalline structure. Bronze is frequently used for pump casings when the liquid pumped is mildly corrosive, as for instance, sea water. Cast steel or even forged steel is used when the discharge pressure or the pumping temperature or a combination of both makes cast iron unsuitable for the application, while stainless steel casings are used when the pumped liquid is corrosive or excessively abrasive. Porcelain or glass casings are sometimes used for very special applications.

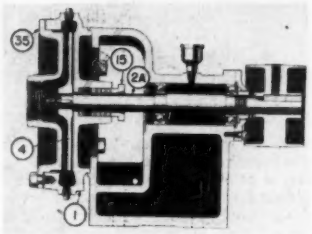

Fig. 1. Section of an end-suction, single stage centrifugal pump designed for light duty service

Impellers. Bronze impellers are generally preferred when handling average waters because bronze is easier to cast when complicated cored sections are involved, it is easier to machine, smoother surfaces can be obtained and finally, because bronze does not rust. However, it is not desirable to use bronze impellers with cast iron casings if the liquid handled is a strong electrolyte. In such cases, regular or alloy cast iron, cast steel or even stainless steel may be used. The latter materials, while more costly than regular cast iron, have a great number of advantages which make them preferable.

Because of the higher coefficient of thermal expansion of bronze when compared to that of steel shafts, bronze impellers are seldom used when the liquid temperature exceed 250 to 270°F and preference is given to cast steel or stainless steel at higher temperatures.

Wearing Rings. Wearing rings are usually made of bronze for the same reasons as the impellers. However, cast iron, cast steel, stainless steel or monel

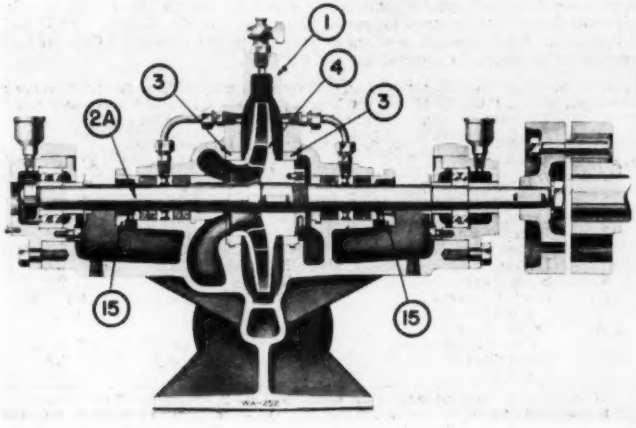

Fig. 2. Section of a single suction, single stage pump without shaft sleeves

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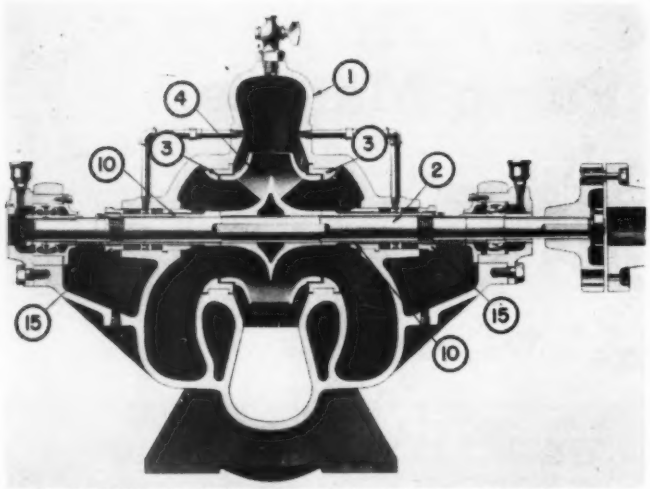


Fig. 3. Section of a double suction, single stage pump with shaft sleeves

rings are sometimes used, regardless of whether the impeller itself is made of bronze or of another metal. Such metals are used when hardness or other properties unobtainable with bronze are required.

Shafts. In pumps where shaft sleeves are used, shafts are generally made of open hearth steel. When high stresses are to be encountered, preference may be given to high tensile strength alloy steels. When corrosive liquids are handled, some seepage may occur either thru the pores of the impeller hub or thru the joint between the impeller and the sleeves thus requiring the use of a non-corrosive metal like stainless steel, phosphor bronze, or monel metal. The shafts of pumps which are made without shaft sleeves are generally made of a non-corrosive metal like stainless steel, phosphor bronze, or monel metal depending upon the liquid to be handled.

Shaft Sleeves. In the majority, shaft sleeves are made of bronze. When bronze sleeves are not satisfactory because of their relative low degree of resistance to abrasion, stainless steel is used. While a few years ago, steel sleeves were more prevalent than stainless steel, the growing popularity and reduced cost of the stainless alloys has caused stainless steel to supersede ordinary steel and, in some services such as boiler feed, even bronze as shaft sleeve material.

A shaft sleeve which protects a shaft in a stuffing box must be made of a material that can be given a smooth finish so it will operate properly in conjunction with the packing. Thus cast iron is rarely used for shaft sleeves.

Glands. Glands are generally made of bronze, although cast iron or steel may be used for all-iron fitted pumps. Where pumps are handling hydrocarbons, iron or steel glands are bushed with bronze to avoid possible sparking which might ignite inflammable vapors.

The expression "pump fittings" is used rather loosely to mean two entirely separate things. In the most accepted sense, it refers to the general construction features of the pump, as for example "ball bearing fitted pump," or to the combination of materials used in the pump, as in "all iron fitted pump." (See Table I.) In a different category (such as when applied in the expression "underwriter fittings"), it may refer to various pieces of auxiliary equipment, such as valves, gauges or even tools.

Standard Fitted Pump. The so-called "standard fitted" centrifugal pump as defined by the Hydraulic Institute is bronze fitted. It has a cast iron casing, steel shaft, bronze impeller and wearing rings and bronze shaft sleeves, when used. Some manufacturers regularly furnish stainless steel shafts on pumps without shaft sleeves as Standard Fitted Pumps.

Various centrifugal pump manufacturers have developed specific material selections for pumps designed for special services. When a pump is so constructed it is generally termed as a "standard pump" although reference is sometimes erroneously made to "standard fitted pump," even though the materials used do not correspond to the Hydraulic Institute definition.

All-Bronze Pump. When all parts of a centrifugal pump which come into contact with the liquid pumped are made of bronze, the pump is considered to be an "All Bronze Pump."

Acid-Resisting Pump. An acid-resisting pump is such that all parts of the pump in direct contact with the liquid pumped are constructed of such materials as will offer the maximum resistance to the corrosive action of the liquid.

Salt Water Pumps

Centrifugal pumps handling salt or sea water may be built with standard fittings, that is cast iron casings and bronze trim, in all-iron, all-bronze or with iron casings and stainless fittings, depending on a number of factors.

Thousands of standard fitted pumps are in use handling sea water, but occasionally that type is not suitable, mostly when the sea water is contaminated as is the case with harbor waters. Failures are usually due to galvanic action between the bronze parts and the cast iron casing which graphitizes and is ultimately a total loss. Under high suction lift conditions, galvanic action is accelerated due to the release of oxygen from the water.

While an all-iron pump avoids the electrolytic action between bronze parts and cast iron casings, such action may occur nevertheless. A certain amount of iron dissolution may take place, leaving graphitized areas. These areas perform as cathodes to the untouched anodic parts of cast iron and the resulting galvanic action is self-accelerated.

To avoid the graphitization and poor resistance to cavitation of cast iron impellers, these together with other small pump parts may be made of stainless steel.

An all-bronze pump should give longest life for most sea water conditions.

This is Part I of a two-part article on Centrifugal Pump Materials by Mr. Karassik and Mr. Carter. Part II will appear in the January, 1950, issue.—EDITOR.

Table I. Materials used in three common types of pump fittings for parts coming in contact with liquid. Materials for bearing housings, bearings and other parts are not generally affected by the liquid hand'ed

Materials Used in Different Types of Pump Fittings				
Part No.	Part	Standard	All Iron	All Bronze
1	Casing	CI	CI	BR
35	Suction Head	CI	CI	BR
4	Impeller	BR	CI	BR
12	Impeller Ring	BR	CI or ST	BR
3	Casing Ring	BR	CI	BR
	Diffuser	CI or BR	CI	BR
5	Stage Piece	CI or BR	CI	BR
2	Shaft (if sleeve is used)	ST	ST	ST, BR, or MO
2-A	Shaft (if no sleeve is used)	SS or ST	SS or ST	BR or MO
10	Shaft Sleeve	BR	ST or SS	BR
10	Gland	BR	CI	BR

CI, cast iron. BR, bronze. ST, steel. SS, Stainless Steel. MO, Monel

Part numbers on this list and on accompanying drawings conform to a proposed standard listing suggested to the Hydraulic Institute by Charles J. Tullo, assistant chief engineer, Worthington Pump and Machinery Corp. This proposed standard gives stationary parts odd numbers and rotating parts even numbers.

SELECTION, USE AND CARE OF TOOLS

Adjustable Wrenches—Freely working parts and simple construction are two virtues to look for

By THOMAS TRAIL

ADJUSTABLE WRENCHES are useful for jobs within their strength and capacity. They are made in several types and in a number of sizes, as follows.

Adjustable End Wrenches: These are similar to solid open end wrenches but have an adjustable jaw to permit varying of the opening between the jaws, as shown in Fig. 1. Wrenches of this type are made in carbon and alloy steel, the latter being more costly but having much thinner parts and greater strength, a desirable feature where heavy work must be performed in close quarters. Adjustable end wrenches are made in sizes from 4 to 24 inch, with corresponding jaw opening capacities.

Monkey Wrenches: These wrenches have an adjustable jaw also, but it is arranged on the side of the wrench, as shown in Fig. 2. This design permits greater movement of the adjustable jaw, consequently these wrenches have a greater jaw opening capacity than adjustable end wrenches of the same size. A similar wrench of lighter weight is known as an automobile wrench.

A late development in adjustable wrenches is called a locking grip wrench. This is actually an end wrench, but it is fitted with an adjustable lever that snaps over center and thus exerts constant gripping pressure on the jaws. This wrench is made in one size only. It has grooved jaws that permit it to grip almost any shape object with a positive non slip locking action. Fig. 3 shows a wrench of this type.

Pipe Wrenches: There are several types of pipe wrenches on the market. One of these is generally considered as a standard and practically all other types are intended for special applications. Some wrenches have their jaws on the end or at an angle, in order to facilitate their use in close quarters.

In choosing adjustable end wrenches, examine the fit of the various movable parts to see that there is no excessive lost motion present. See that the movable jaw aligns reasonably well with the fixed jaw, and that the mechanism does not bind or jam, especially after being placed under strain while in use.

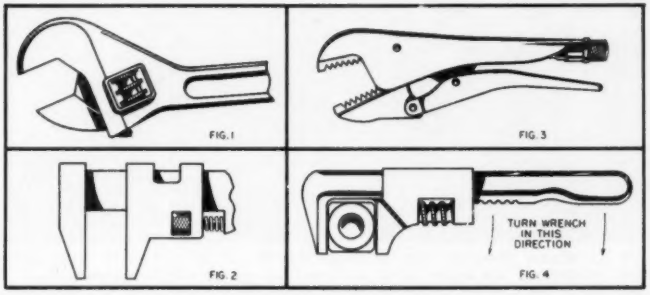


Fig. 1. Adjustable end wrench. Fig. 2. Monkey wrench (adjustable jaws on the side) Fig. 3. Locking grip wrench. Fig. 4. Proper method of use for adjustable end and monkey wrenches

The same details apply to monkey or automobile wrenches, but a little more lost motion can be expected since these tools are intended for larger sizes of work. While all-metal handles are to be preferred, some good patterns of monkey wrenches are fitted with wood handles.

In selecting pipe wrenches, look for reasonably sturdy construction, simple design, well fitted but freely working parts, and replaceable wearing parts. See that the jaws have sharp, clean cut teeth and that they align satisfactorily. Try the grip of the jaws on a piece of pipe or other round metal object. They should grip easily and automatically, when properly set, by light pressure on the handle, and should release readily when pressure is removed from the handle. See that the wrench handle is at right angles to the work when the jaws are gripping the work. After removing the wrench from the work, try readjusting the jaws to determine whether the mechanism operates freely. All-metal handles are definitely to be preferred on pipe wrenches.

Where possible, adjustable end and monkey wrenches should be used as shown in Fig. 4. Turning the wrench in this direction will cause less strain on the movable jaw. Of course, these wrenches are intended for turning in either direction where such use becomes necessary.

In using any type of smooth jaw adjustable wrench, be sure to have the jaws tight on the work. This will prevent slippage of the wrench and unnecessary strain on the jaw parts.

The handles of adjustable end wrenches up to 12 in. size are so proportioned as to provide safe leverage at maximum jaw opening, consequently the use of an extension handle or a hammer to exert additional leverage may result in damage to the wrench. Wrenches from 15 in. size and up, however, are fitted with taper handles and are designed to permit the use of a pipe extension on the handle.

In using a pipe wrench, it is best to use one hand to hold the wrench by the handle and the other hand to support the movable jaw end of the wrench. This permits greater speed and control and requires less effort in handling the wrench.

Great caution should be exercised in the use of extensions on pipe wrench handles, since this may strain the jaws out of shape or may crack the adjusting nut.

Abuse or neglect of adjustable wrenches can easily cause failure of their parts to function properly. Always keep such tools clean and the operating parts oiled. Wiping the entire wrench occasionally with an oil moistened cloth will help prevent its becoming rusted. If the wrench needs to be taken apart for cleaning, oiling or repairs, be sure to replace the parts in their proper order, and see that holding screws or nuts are locked tightly in place by slightly burring the surrounding metal.

IN A CONTINUOUS strip rolling mill, the flat rolled strip is traveling faster at the finished end than at the beginning even though the steel is one continuous piece. The explanation is that as the steel is rolled thinner at each roll, the metal is elongated and the next set of rolls must turn faster to take up the slack. The speed may increase from a few hundred feet per minute at the beginning to nearly a mile a minute at the end.

Fig. 1. Master Mechanic Art Johnson inspects the alloy bars reinforcing the dipper stick on this 5 cu yd shovel. Bars 1½ in. by 6 in. by 22 ft long extend along the top and bottom of the stick. The bars shown have been in service for 7 months compared to previous two month service of mild steel

Fig. 2 Vibrator discharge chutes of ¾ in. alloy have lasted more than 6 times as long as the mild steel previously used for the chutes. Approximately 240,000 tons of concentrate passed over this plate under water wash during the 1948 season of 6½ months; mild steel lasted an average of less than one month

Steel That's Designed for Impact and Abrasion

Plant Engineering
Product Application Feature

Field tests on this new, tough alloy show that it has amazing abrasion and impact resistance . . . In tough service at Minnesota's Mesabi Iron Range, it has taken everything that has been thrown at it and stood up well . . . Characteristics and some of the problems encountered in installation of plates . . . Welding and bolting procedures detailed

MAINTENANCE MEN for the Inter-State Iron Company on Minnesota's Mesabi range have come to know Jalloy steel as "that hard stuff." They have seen it as chute plates, truck bottoms, bang-boards, baffle plates, wear plates, shovel dipper stick reinforcing, and special studs during exhaustive field tests. Wherever abrasive wear was eating through mild steel, wherever impact and abrasion was creating a costly maintenance problem—out came the mild steel, and in went this new alloy.

Designed specifically for abrasion and impact resistance, this heat-treated plate has a yield strength of 160,000 psi as compared to 25,000 to 30,000 psi for unheat-treated mild steel. It has a Brinell hardness of 341 to 388, as compared with 99 to 126 for unheat-treated mild steel. It costs approximately twice as much as mild steel.

Generally, this alloy has lasted four to six times longer than mild steel it replaced, saving more than 50 per cent in the cost of steel for applications where used. It also has saved several thousand man-hours work on replacement installations. It has contributed thousands of tons of ore through greater production efficiency.

In the beginning, there were problems in installation. Heat-treated plates for abrasion and impact resistance are so hard they can not be cold-formed. Plates must be cut to fit flat dimensions. This is usually done at the Inter-State Iron Company mines with acetylene burning equipment. No difficulties have been encountered from this operation.

The plates are fastened in position, either by bolting or welding, or in some cases, both. Holes for countersunk bolts are drilled in the plate with standard high-speed drilling equipment. Plates are then bolted to a framework of wood or mild steel.

In welding this alloy, the men at Inter-State found the answer in a weld metal from ferritic electrodes with a stainless type coating and a special welding technique. Using these special rods, they welded plates together by skip-welding 6-in. weldments 12 in. center to center done in two passes to make a continuous weld. Because of the ductility of the weld metal and the low heat built up in the plates, the weld is sound.

Additional information on this alloy will be forwarded on request. Simply use the postcard on pp. 19 and 61.

As these fabrication methods were worked out, the plate began to go into a variety of places in Inter-State Iron Company's five active open pit mines near Virginia and Hibbing, Minnesota. As mild steel plates wore out, the new plates replaced them. By the beginning of the 1948 ore season, this heat-treated plate was in nearly every major application for which it was suited, at all four mines.

Winter Repairs

During the winter months, most activity at the ore screening and washer plants is centered around repairs and replacements, and preparation for the next season. The new alloy is fitting into this cycle of operations far more efficiently than mild steel.

By judiciously selecting proper plate thicknesses, Inter-State Iron Company's maintenance men are installing Jalloy estimated to last a full season in many cases. This is especially true in locations such as main ore pocket chute liners where wear is continuous, and failure may not only result in costly over-time repair but may hold up production as well.

All photos courtesy Jones & Laughlin Steel Corp.

Fig. 3. More than 1,400,000 tons of iron ore and rock, up to 4 ft in diameter, were dumped 14 to 16 ft onto this alloy plate. The ¾ in. plate lasted for two full seasons in comparison with the previous three month life of former material

Underfloor Building Services, Overhead Exhaust

Contributed by H. B. Clark
Project Arch., Westinghouse

THE LUBRICATING system serving the wire drawing machines at our Buffalo Life-Line motor plant presented a problem. Supply and return lines, pumps, cooling towers and controls made up the system. In the plant revision the supply and return lines were placed under the floors as shown in Fig. 1. To further complicate the underfloor installation, an enamel distribution line was installed in which constant liquid temperature is maintained to insure peak efficiency at the towers.

In order to maintain this constant temperature a large underground pit was constructed and was located beyond the limits of the building adjacent to a railroad siding to house the storage tanks containing the various types of enamel and varnish. Heating and ventilating equipment was installed in this underground room to maintain constant temperature and humidity. These stored liquids were piped into the building through a heated tunnel from which branch supply and return lines run to each enameling tower.

Heat and fumes generated in the enameling towers are drawn off by the ventilating system shown in Fig. 2. The wire covering areas were enclosed with masonry and Gunite walls and air conditioning equipment installed to provide ideal conditions for covering copper wire. This arrangement gave very satisfactory results.

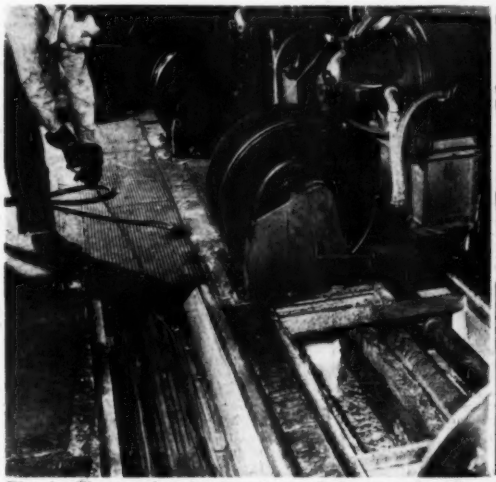


Fig. 1. These underground systems of flumes and piping carry electrical service, lubricating oil and enamel

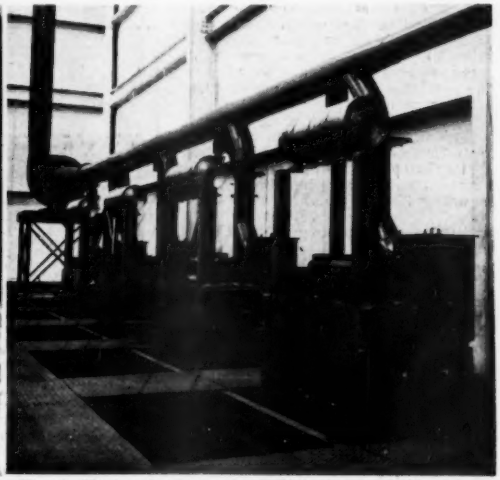


Fig. 2. Heat and fumes generated in the enameling towers are carried off by the ventilating ducts visible above the spools of wire

Install the Kind of OUTDOOR LIGHTING That Pays Off

Actual figures in foot-candles and wattage per square foot required for proper illumination of various plant areas . . . How to light loading platforms . . . Two methods of lighting parking lots . . . Illumination of passageways and wider areas between buildings . . . Proper protective fence lighting . . . Movable units for construction, fire protection

By **R. J. SWACKHAMER** and **J. P. RUTHERFOORD**
Lighting and Rectifier Divisions, General Electric Company

IN TODAY'S highly competitive market, where the goal of all progressive manufacturers is more efficient production at less cost, increasing emphasis is being placed on adequate outdoor plant lighting. The reason is crystal clear: through proper illumination of loading platforms, internal roadways, active storage areas, parking areas, and property lines, expenses can be reduced, dollars saved.

Comfortable seeing for plant employes at night—through the use of planned, modern lighting — results in quicker, more efficient materials handling with less damage to materials and equipment; fewer accidents and less waste; and greater protection from trespassers and thieves. Important too, is the fact that the value of good plant lighting is reflected in a better relationship between employes and management.

Planning an outdoor lighting system for an industrial plant often requires the specialized knowledge of a reputable electrical contractor, lighting equipment manufacturer or distributor. The services of these in supplying specifications, recommendations, and layouts are always as available as your nearest phone. Still, it is the wise plant engineer who keeps abreast of new trends, developments, and equipment in this field.

He should first determine the minimum lighting requirements of each area within his plant; then he should select the fixtures which best fulfill these requirements. Take, for instance, the problem of lighting a loading platform or ramp.

While work of an exacting nature is almost never performed on a loading platform, it is, nevertheless, important that sufficient well-distributed light be provided. This can be supplied, by mounting 20 to 28 ft above floor level, either wide-angle floodlights or pendant-type street luminaires which produce a symmetrical light distribution. Light provided evenly on all surfaces, vertical and horizontal, is necessary so that workers can easily read the shipping instructions on the sides, as well as the tops of boxes and bales. For platforms operated on an all-night basis, 500-watt lamps on 60-ft linear spacing will provide sufficient illumination.

Plant roadways should be given the same consideration, as far as lighting equipment is concerned, as city streets and thoroughfares. The amount of traffic and the width of the roadway will determine, to a large extent, the type of optical assembly, the mounting height of the luminaire, the length of the overhang mast-arm, and the normal lamp size.

Parking lots less than 250 feet wide can be well lighted by medium or wide beam floodlights mounted anywhere from 20 to 40 feet high on conveniently located buildings. Approximately 0.25 footcandles is usually adequate for a small lot. For larger parking areas, two lighting plans have been proved satisfactory:

1) Pendant-type incandescent street luminaires which produce a symmetrical light pattern and can be mounted on twin lighting standards spaced about 200 ft apart, as shown by Fig. 1-A. For best results, the fixtures should be mounted 25 to 30 ft above the ground and equipped with 500-watt lamps.

2) An alternative is to mount four wide-beam floodlights on 50 to 70-ft poles, with the poles spaced at 300 to 450-ft intervals along the center line of the lot, as shown by Fig. 1-B. In most cases, 1000-watt floodlights should be spaced 300 ft apart and 1500-watt units 450 ft apart. By aiming the lights at 90-deg angles, coverage can be obtained for 90,000 to 200,000 sq ft of the lot, depending upon the lamp wattage and the level of illumination desired.

Passageways between factory buildings require different types of lighting equipments, depending upon the size of the areas to be lighted. Very narrow alleyways can best be lighted by suspension luminaires mounted on the sides of the buildings, with the spacing determined by the amount of illumination desired. A typical industrial installation is shown by Fig. 2. For areas from 150 to 250 ft wide, wide-beam floodlights should be placed on the sides of the building or edges of the roof and directed down into the area.

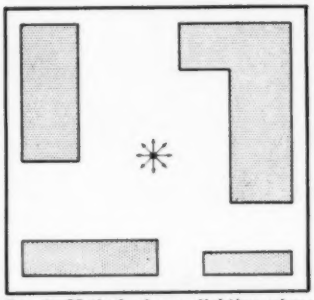


Fig. 2. Method of area lighting where the distance between two factory buildings is too great for efficient lighting from the buildings themselves, or where the buildings are not high enough

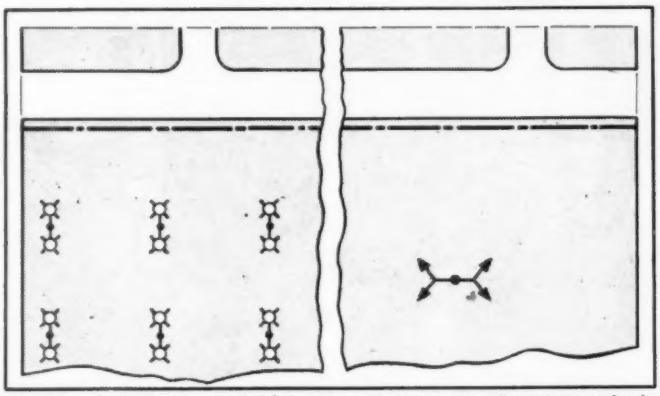


Fig. 1-A. (Left) Parking lot lighted with pendant-type incandescent street luminaires. Fixtures equipped with 500-watt lamps should be mounted about 25 to 30 ft above the ground on poles spaced about 150 ft apart. Fig. 1-B. (Right) Another method of parking lot illumination. Here four wide-beam floodlights set at 90-deg angles are mounted on 50 to 70-ft poles on the center line of the lot. With 1000-watt lights, poles should be spaced about 300 ft apart; with 1500-watt units, about 450 ft

Fig. 3

Fig. 4

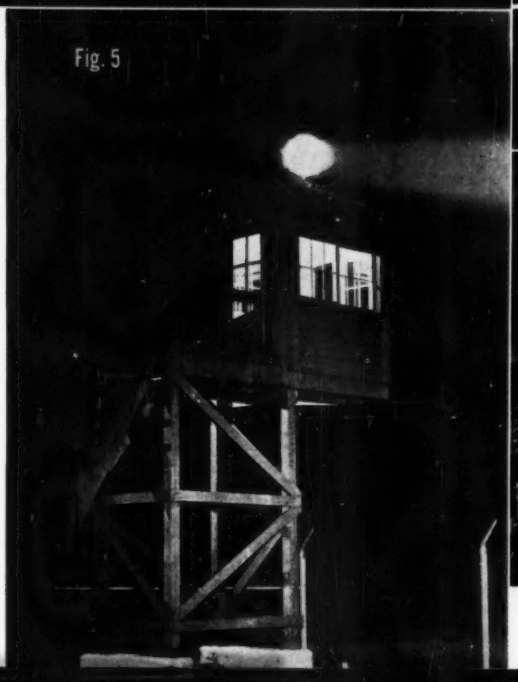


Fig. 5

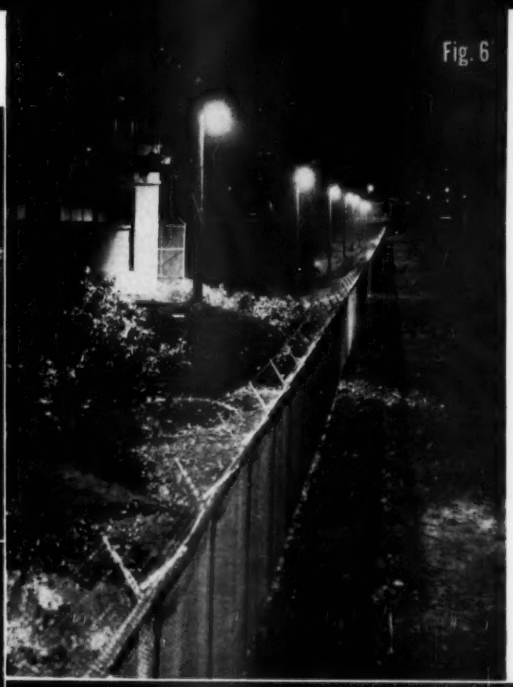


Fig. 6

Fig. 7

Fig. 8

If the distance between buildings is more than 250 ft, both narrow-beam and wide-beam floodlights should be combined to attain the best levels of light distribution. Experience shows that approximately 0.10 to 0.25 watts per sq ft is required, depending on the use to which the area is put. If the total area in square feet is multiplied by 0.10 or 0.25, the result will indicate the total number of watts which should be used. Whether these watts should be concentrated in a few large floodlights, or a large number of smaller ones, depends on the character of the area and the coverage required.

The more an area is cut up with recesses, the greater should be the number of floodlights used to eliminate dark corners. Floodlights with many different beam characteristics are available; these can be combined to fit, to best advantage, areas of any size and shape. As a rule, not less than two floodlights should be used to eliminate shadows and to avoid the complete loss of protection and coverage in event of a lamp failure.

Platform Mounting

Another effective method of area lighting can be used where the distance between two factory buildings is too great for efficient lighting from the buildings themselves, or where the buildings are not high enough. A steel pole, from 50 to 75 ft high, can be erected in the center of the area, on top of which is a metal platform for mounting the number of floodlights required to light the area, Fig. 3. In general, this type of lighting requires 0.10 to 0.25 watts per sq ft of area. The oil refinery shown in Fig. 4 is lighted by this method.

Where outdoor construction is in process at night, adequate floodlighting is a must for accurate, fast, and safe work. Several floodlights mounted on fixed poles have been proved superior to a temporary system which requires constant shifting of lamps, dish-pan reflectors, and wiring to meet the ever-changing requirements of the work. Sometimes, however, it is practical to use portable light towers mounted on timberskids which can easily be dragged by truck from place to place.

All industrial plants, particularly the large ones, should have available for emergencies, such as fires and accidents, portable, heavy-duty lighting equipment which can quickly be moved to the scene. Heavy-duty floodlights with extra-long extension cords or light trucks with a gasoline motor-generator set and several swivel-mounted floodlights will provide an effective buffer against such emergencies.

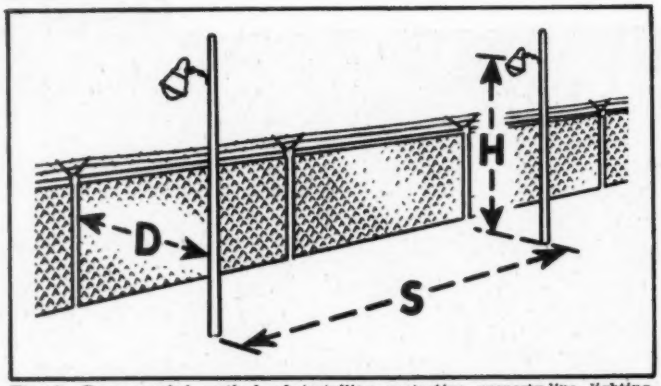


Fig. 9. Recommended method of installing protective property-line lighting. Pendant-type street luminaires are used which can illuminate a 40-ft band along the fence line. Usual distances are: H, 25 to 30 ft; D, about 10 ft; S, about 150 ft

Property-line lighting is another important consideration in the protection of an industrial plant against theft of, or damage to, materials or equipment. Lights should be so placed that the vision of watchmen or guards is enhanced. This can be accomplished by revealing a would-be-intruder in full, direct beams of light, which conceal the watchman in comparative darkness. The lighted zone should extend far enough on both sides of the property line so that an intruder will be visible for as long as possible during his attempted entry. (Figs. 6 and 7.)

Naturally, the method of lighting property lines will depend to a great degree upon the type of terrain outside the plant fence; the presence of dwellings, railroads, highways, and rivers; and the method of patrolling. Most-often recommended for protective-line lighting are pendant-type street luminaries which can illuminate a 40-ft band along the fence line. These can be mounted 25 to 30 ft above the ground on poles set back from the fence about 10 ft. Figs. 9 and 10. Naturally, if a brick or other solid fence surrounds a plant, the lights should be mounted right at the fence line. Spacing of these fixtures will depend upon the light level desired and the type of optical assembly used in the luminaire.

For safety and security purposes and to make sure that only authorized personnel gain entry, good lighting of entrances is recommended. (Fig. 8). Properly illuminated gateways make it easy for guards to check credentials, as well as material being taken in or out of the plant. One 500/1000-watt medium-angle floodlight mounted 25 ft above the ground will provide sufficient lighting for a two-lane gate.

To supplement the general protective illumination around an industrial plant, it is often desirable to provide one or more searchlights which may be mounted on the roof of guard towers and operated from within the tower, either vertically or horizontally. These provide a means of quickly lighting fenced boundaries, (Fig. 5), waterfronts, and railroad sidings.

For the many applications described above, manufacturers of outdoor lighting equipment have a wide variety of

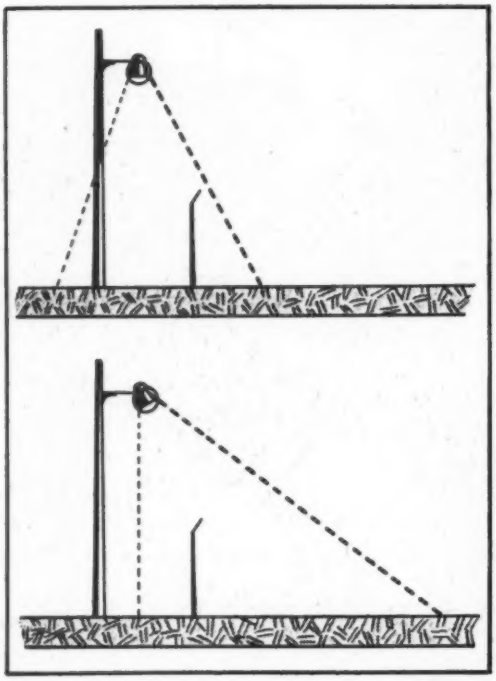


Fig. 10. With fence luminaires in vertical position, above, protection is less effective than when turned outward, as below. In the latter position approaching intruders are visible at a greater distance while guards inside the fence are concealed in comparative darkness

The STANDARDAIRE *Axial Flow* BLOWER . . . . .

Makes RPM=CFM . . . a performance typical of our No. 5 positive displacement blower—suitable for capacities of 800 to 2200 CFM at speeds of 800 to 2200 RPM operating at differential pressures of 2 to 20 p.s.i. The Standardaire No. 5 Blower offers this flexibility of operation plus the desirable characteristics of extremely low noise level and high efficiencies. To insure long service life under continuous operation these features have been built into the modern design Standardaire Blower: accurately generated, screw type rotors . . . shaved helical gears . . . precision, oversize, anti-friction bearings . . . oil pump with filter and strainer . . . three-point mounting. For further details write the Standard Stoker Company, Inc., Dept. A-6, 370 Lexington Ave. New York 17: N. Y.

A UNIQUE PULLEY ATTACHMENT . . .

The Standardaire No. 5 Blower will deliver a cubic foot of absolutely clean air for each revolution of its main rotor. Although direct drive from a motor ordinarily meets requirements, at such times when direct drive cannot be used a novel type pulley may be applied and a wide range of speeds gained. Each speed will give a definite air output to meet exacting demands. Contrary to the usual practice, the pulley is not mounted directly on the blower shaft. It is carried on an extra, [illegible] bearing which, in turn, is supported within a hollow [illegible] mounted on the [illegible]. The pulley is driven [illegible] an internal gear type [illegible] bearing, received [illegible]

THE STANDARD STOKER CO • INC •

A PRODUCT OF [redacted]

NEW YORK • CHICAGO • ERIE • MONTREAL

luminaries, floodlights, both open and closed, and searchlights from which to select those that are most economical to install, operate, and maintain. Whenever possible, it is most economical to select luminaries and floodlights which are heat, dust, water, and corrosive resistant. Of primary importance, is the selection of luminaires which have built-in optical assemblies to do your lighting job right. Some produce a symmetrical light distribution; others, through deflectors and refractors, or combinations of both, provide asymmetrical distribution. Your electrical contractor, lighting equipment manufacturer or distributor can advise you which is best for any specific lighting job.

Naturally, in any discussion of outdoor lighting, consideration should be given to the lighting circuit. Underground distribution systems are preferred, with the necessary wiring above the ground carried in conduits or inside the poles. If overhead lines are used, they should be placed as high as possible—and not accessible from pole steps or fence tops. Control equipment may be actuated by push buttons, time switches, or photoelectric relays; but auxiliary manual control should also be provided. Either series or multiple distribution circuits, whichever is most advantageous from an operational and economics point of view, may be used.

Plant Engineers' Digest

(Continued from page 16)

needed if satisfactory adhesives are to be developed for specific applications: What constitutes a good bond? Are the forces of adhesion physical or chemical or both? What effect have solvents, fillers, plasticizers, and other ingredients in adhesive formulations on final joint characteristics? Can simple, rapid tests be developed that will predict the durability of a glue joint?

The question of what constitutes a good bond has been the subject of much investigation and debate. It has been found that good wettability is one of the most important factors in the formation of good bonds. Wettability may be measured by determining the angle that a drop of liquid adhesive makes with a flat surface of the adherent in question. *By Arthur E. Gabriel in Frontier, Sept., 1949, a publication of Armour Research Foundation of Illinois Institute of Technology.*

Save Your Tires By Collecting Nails

MANY STATE highway departments use trucks equipped with huge magnets to pick up nails and jagged bits of metal from heavily traveled highways, to lessen the danger of tire damage.

Now an enterprising truck driver in Toledo has adopted the idea and built it into a fast-growing business, serving parking lots, truck terminals and industrial plant yards.

This "magnet on wheels" has proven very useful in picking up nails and bits of metal in parking lots, truck terminals and industrial plant yards

He has mounted a 1,000-lb magnet on the front of a small truck. By hydraulic lifts, the magnet can be raised or lowered. In a single truck terminal, he has picked up 1,200 lb of nails and jagged metal in a few hours.

Electric power for the magnet is provided by a 2-kv generator. Dashboard controls enable him to raise or lower the magnet and switch on or off the electric power.

In winter, the operator plans to expand his service by converting the vehicle to use as a snowplow. *From Automobile Facts, a publication of Automobile Manufacturers Association, Detroit 2, Michigan.*

Emergency Pipe Line

IN JUNE, 1949, the town of Barrington, Rhode Island, was at a loss for water due to a break in the main pipe line.

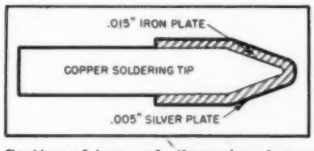
Here was a major repair job that would probably take weeks. But, the urgent problem of how to supply Barrington was solved by a fire engine to furnish pressure, a temporary line of Transite asbestos-cement pipe and a manual of wartime emergency suggestions.

Barrington and its twin city of Warren are served by the same water company. Starting the emergency line at a hydrant in Warren, the Transite pipe was laid on top of a concrete sidewalk, passed over broken ground, carried across a railroad trestle spanning the Warren river and finally, was connected up with the Barrington water system. Then the fire engine started pumping water to the faucets of Barrington from this emergency line some 1146 ft long which had taken two days to complete. *From The Power Specialist, a publication of Johns-Manville, New York 16, N. Y.*

Increased Life for Soldering Tips

A MEANS OF increasing the life of the copper tips of self-heating soldering irons has been found by Westinghouse Elec. Corp. Normally, a copper tip, when used in continuous service, has a life of only a few weeks due to oxidation and alloying with the solder. But by plating the tip with a heavy coating of iron followed by a light plating with silver, the tip can be used for years rather than weeks.

The iron coating serves as a barrier between the copper of the tip and the solder. The silver coating facilitates



Coating of iron and silver gives longer life to the soldering tip

the initial tinning of the iron and prevents the base of the tip, surrounded by the heating element, from oxidizing and freezing in the socket.

The iron plated tips do not drip solder and are excellent for close work. The plating also eliminates the need for cleaning, filing and dressing at two hour intervals. *From Maintenance News, a publication of Westinghouse Electric Corporation, East Pittsburgh, Pa.*

Weldability of Ferrous Metals

MILD STEEL, medium carbon steel, 3 per cent nickel steel, and wrought iron present no difficulties and their ductility is such that little if any troubles are experienced from cracking after welding. A neutral flame is used.

High carbon steels are more difficult owing to a natural tendency for reaction between the carbon content of the molten metal and any oxygen present. A carburizing flame is necessary and the work should be covered by the flame at all times during welding. Do not allow the primary cone of the welding flame to come in contact with the molten metal or porous welds will result. A tendency towards air-hardening in the heat-affected zone during cooling makes the possibility of crack formation greater than with the mild steels. Preheating followed by controlled cooling may often be necessary therefore.

Low-alloy steels are very difficult to weld without cracking due to the tendency of many of them to air-harden intensely after welding. Careful preheating, controlled welding procedure and delayed cooling are nearly always required.

Heat-treated steels are always a problem for welding and the heat applied will in any case nullify the heat-treatment effect. Generally such steels teem with difficulties if welded in the heat treated state but become much less formidable when fully annealed. As to whether these materials should be tackled by the Engineer Welder will depend upon his metallurgical knowledge of the alloy in question and his

"facilities" for a proper heat treament of the part afterwards. Springs and many engineering tools will come in this category.

Stainless steels of the 18/8 type are not very difficult to weld but here again the work must be protected by the reducing action of the flame. If you must make interruptions during welding, draw the flame away slowly keeping the metal covered by the flame at the same time, and always run off on the welding rod at the completion of welding—otherwise you will get blowholes in the weld metal.

High speed steels are an extremely difficult proposition and are almost impossible to weld in the fully hardened state without very serious troubles from cracking.

Highly alloyed steels of the austenitic class do not present insuperable difficulties as regards actual welding but the filler metal here is very important. It should be precisely the same type as the metal being welded.

Cast iron of the ordinary "grey" variety is easy enough to weld if you preheat properly and cool slowly. Blowholes and hard spots should not crop up these days.

White cast iron of both plain and alloyed variety are far more difficult owing to their inherent lack of ductility and a higher expansion rate. Such a combination does not make for trouble-free welding conditions. Alloy "grey" cast irons will vary in their weldability much in the same way as "alloy" steels and the same remarks are applicable more or less.

Malleable cast irons are a very difficult proposition for welding altogether. Fusion welding of these materials is not possible without intense hardening in the heat-affected zone, and even the most skilled of welders cannot avoid the presence of blowholes. Bronze-welding is the usual method employed to join them, and is perfectly satisfactory. *From a paper by T. F. Palmer in the Journal of Incorporated Engineers, Aug.-July, 1949, a publication of Incorporated Plant Engineers, Solihull, Birmingham.*

Stainless Steel Belts for Conveying Coal

A TEST has been conducted of a stainless steel conveyor belt for carrying coal and has proven successful. Although the tests have not proved that stainless steel conveyor belts have been developed to the point of commercial utilization for this purpose, they do show that the basic fundamentals of such use are sound.

Mr. Gerald von Stroh, director of the BCR Mining Development Program, pointed out that steel conveyor belts had been used in Europe for many years and that as early as 1912 something in the order of 500,000 hp was being transmitted by steel belts. To the best of his knowledge, stainless steel with its superb properties had not been used in Europe.

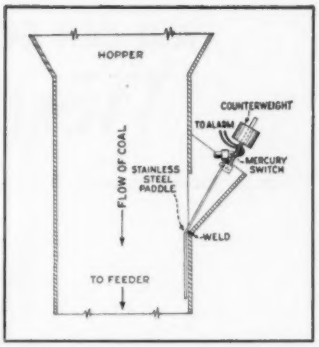
Mr. von Stroh further pointed out that steel belts should not be expected to function efficiently on steep slopes. There is a definite limitation to the width of stainless steel sheet that can be rolled continuously. The ideal arrangement would involve the judicious use of steel and rubber conveyor belts. *From Bituminous Coal Research, a publication of Bituminous Coal Research, Inc., Pittsburgh 22, Pa.*

Avoid Explosions With "Low Coal" Alarm

A RECENT EXPLOSION in the firebox of a large pulverized-coal-fired boiler at a midwestern glass factory showed a definite need for a "low coal" alarm mechanism of the type shown in the drawing.

This explosion resulted from an interruption in the coal feed, which extinguished the flame and let unburned coal into the firebox.

After the explosion, the operator shut down the boiler and shifted its load to a standby. Upon examination of the damage, they found that the boiler's tubes were displaced and distorted and about twenty-five feet of the breeching was ripped open. *From Factory Mutual Record, October, 1949, a publication of Factory Mutual Engineering Division of the Associated Factory Mutual Fire Insurance Companies, Boston 10, Mass.*



A suggested type of coal alarm, that can be made up by plant mechanics. The stainless steel paddle is installed in the feed pipe to the pulverizer, and in normal operation is held against the side of the pipe by the stream of passing coal. If the stream is interrupted, the counterweight lifts the paddle to operate an alarm

Safety Idea Steps Up With a Lift

THE LOMPOC, Calif. plant of Johns-Manville has replaced its old verticle steel plate storage racks with this new wrinkle in accessibility and safety.

The welder who is shown adjusting the lifting hook is standing with one foot on the steps erected on the front of the rack dividers and the other on the short walkway on top of the divider.

Holding onto the rope of the overhead traveling lift is the working leaderman. Former method of adjustment would have required the welder to slide between the heavy plates. *From the October issue of Johns-Manville News Pictorial, a publication of Johns-Manville, 22 E. 40th St., New York 16, N. Y.*

Formerly a gamble, with a crushed foot for the loser, the removal of metal plates from these storage racks now is practically a sure-thing safety bet since the steps and walkway have been installed

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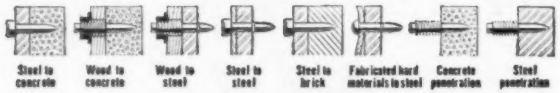

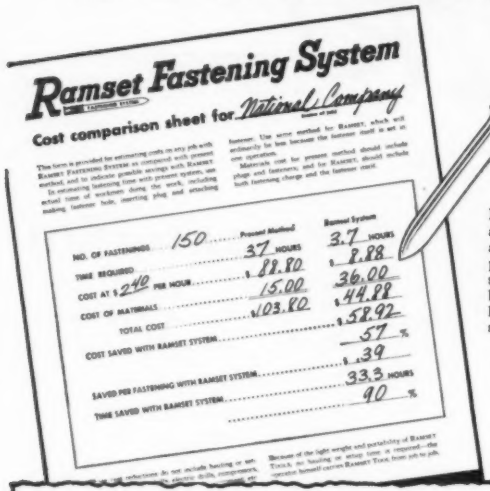

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New Products and Methods

(Continued from page 24)

tool other than a screwdriver is required. Approved by Underwriters' Laboratories. The Unimatic Corp.

16—EXTRACTOR SET

For use on motor bearings, contains 17 large washers

The Bearing Extractor Set includes washers to permit extruding of bearings with $1\frac{5}{8}$ in. bore to 4 in. bore. The spring unit, specially hardened to withstand 10 t pressure, is dropped into the bearing opening and the proper size washer inserted to

keep clips snug against the wall. The push-rod is then inserted in the washer hole and pressure applied.

Because of equalized pressure on all four clips directly, the bearing will move out, manufacturer explains, and this method can also be applied to insert bearings in motor end shields. Walco Electric Products Co.

17—REFRIGERANT PACKAGE

For recharging small units, features disposable container

The Charg-A-Can, weighing approximately 1 lb. is available with Freon-12 and soon will appear with other refrigerants. Advantages claimed include factory control of product purity; avoidance of contamination in transferring refrigerants from large to

small containers; cutting of refrigerant losses, accurate measurement and unusual safety and convenience in use. In recharging, the refrigerant is automatically released by company's adapter valve when can is attached to a standard charger hose. The can is non-refillable and is discarded when empty. Eston Chemicals, Inc.

18—PORTABLE CONVEYOR

Is lightweight unit, built to handle heavy bulk materials

The Handy-Handler was designed to deliver stoker coal, salt, gravel, sand, yet be portable. Constructed of tough 61ST6 aluminum alloy, it may be carried and positioned by one man, manufacturer points out. The lightest of several available models weighs but 119 lb, equipped

with 2 hp gasoline engine. It can be carried anywhere in the factory, and put to use loading trucks, storage bins, filling hoppers and furnaces.

Conveyor comes in lengths from 10 to 20 ft. Standard 16-ft model may be increased to 20 ft by inserting a four-foot midsection. Models are available with choice of three electric motors and three gasoline engines. Removable engine mount is adaptable for all power units. Either rubber flights and continuous rubber belt or steel flights and chain are available. The Belt Corp.

19—CONVEYOR MARKER

May be installed or adjusted to any conveyor system

The conveyor marker is designed to mark only once on each encounter, regardless of size, and to mark containers of varied sizes moving at the same time on one conveyor. It is also adaptable for spot marking on any part of the container by means of adjusting rods and spacing wheels, manu-

facturer reports, adding that swivel bearings on printing element provide a clean and clear impression at all times.

Other applications for marker include its use on sealing, stitching and packing machines, as well as for hand packing. A counting attachment may be used to allow containers to be counted as they are marked. Algene Marking Equipment, Inc.

20—DESIGN LAYOUT INK

Is packed in can, ready for spraying on layout surface

"Push button" application of machinists ink for design layout work is possible with Kempro Design Layout Ink, which is packed in a 12 oz can under pressure and sprayed by merely pressing a button. The ink dries quickly, according to manufacturer, with excellent adhesion to metals, glass and wood. After drying to a thin,

hard, non-glare film it provides a surface for the design layout which is described as heat proof and resistant to cutting oils.

In addition to speed and ease of application advantages, this layout ink is intended to reduce waste since the unused portion is always under cover. It is easily removed with lacquer solvent, toluol or xylol. Costs $1.59 per 12 oz can. Protective Coatings Corp.

21—GASKET CUTTER

Is hand operated and combines functions of several tools

A cutting tool designed to do the work of a circle cutter, straight edge, compass, scorer, and knife in a single manually

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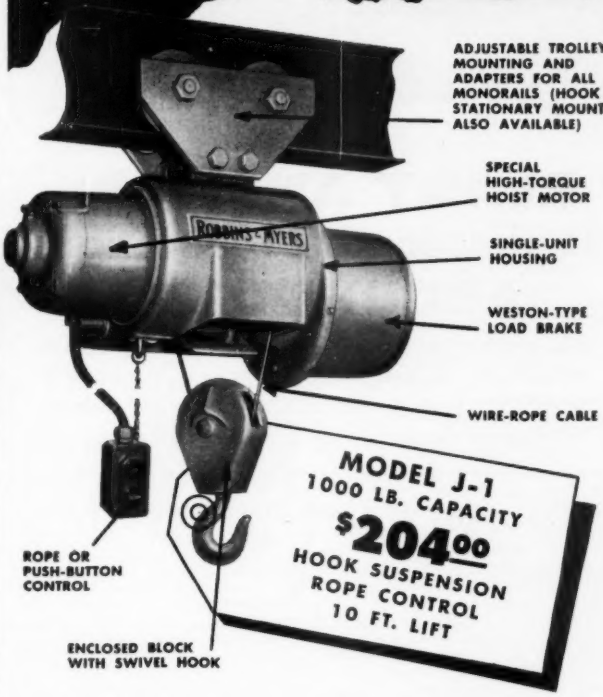

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operated device will be marketed soon. Called the Spearhead Cutter it will cut accurate-size gaskets from any pliable sheet materials in round, odd, straight, square, rectangular, oval or irregular shapes, manufacturer announces.

Made of durable phenolic plastic and weighing less than 4 oz, it is 4¼ in. long, 1¼ in. wide and ¾ in. high. An exclusive feature claimed for it is its "ironing" action while cutting, desirable in preventing thin materials from buckling or crinkling. An indication of the cutter's precision, company points out, is its ability to cut accurately a ¼ in. hole in material ⅛ in. thick.

Cutter comes packaged, complete with instructions, in a kit containing the cutter, cutting board, two blades and two pivot pins. It will retail for $7.50. Zimmerman Packing Co.

22—ELECTRONIC STARTER

For fluorescent lighting, is engineered for increased safety

This electronic safety starter is intended to eliminate fires, short circuits and transformer burn-outs in fluorescent lamp fixtures. Called the Suclar Automatic Safety No-Blink Starter, it is described as an efficient thermostatic relay switch.

Company spokesmen point out that a fluorescent lamp is supposed to light when its starter shoots a high voltage current across the lamp. However, a defective lamp will not light when this charge is delivered. Many starters thus create a hazard by passing a high voltage charge to the lamp indefinitely until the continuous operation overloads the transformer. This is said to be impossible with a Suclar Safety Starter. If it is called on to light a lamp which fails to light within 30 sec, a thermal relay automatically switches off the lamp.

Starters are assembled from non-oxidizing (rust-proof) materials such as brass, copper, phosphor, bronze and bimetal; rust-proof brass rivets are used to provide positive contact and rigid positioning. Suclar Laboratories, Inc.

23—INSTRUMENT PEN

Is designed to run for months without replenishing ink supply

This pen is intended for continuous use in all recording instrument charts,—including orifice meters, proportioning meters, rate of flow controllers, temperature recorders and pressure recorders. With this pen daily ink filling with droppers is eliminated, it is pointed out, and for increased efficiency fast drying inks may be used.

There are no unrecorded intervals, manufacturer states, the pen writes continuously, replenished from a sealed ink supply that is closed to the atmosphere and dirt. This also eliminates dripping in the meter case. When in operation the feed is controlled by capillary action which regulates the ink flow. Due to this feature multiple pens and vari-colored inks may be used without blurring or smearing the record, it is said. Constructed of stainless metal the pen is described as corrosion resistant and built for years of trouble-free service. Chartomatic Co.

24—FUSE LINKS

High surge type, for improved overcurrent protection

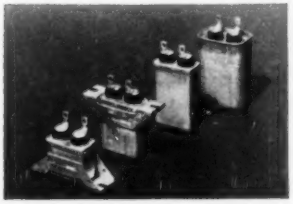
The 10N series of Hi-surge Fuse Links are intended to provide overcurrent protection where 10-amp minimum fusing has been previously used. Available in 2-, 3-, 5-, and 8-amp ratings for overcurrent protection, each of the new links also provides the same surge protection as a 10-amp universal cable-type fuse.

In the short-time range of higher circuits, the time-current characteristics of these links practically coincide with that of a conventional 10-amp fuse, but in the long time, low-current range, the characteristics are essentially the same as the 2-, 3-, 5-, or 8-amp conventional fuse links. They may be applied without rechecking co-ordination with fused line sectionalizing devices. Transformer and Allied Products Divs., General Electric Co.

25—SMALL D-C CAPACITORS

Are intended for use in ambient temperatures up to 125C

These Permafil d-c paper-dielectric capacitors require no derating for temperatures up to 100 C and can be used up to 125 C. Hermetically sealed in metallic containers, the units are available in case styles 61,



63, 65 and 70, as covered by Joint Army-Navy specifications, in ratings of 0.10 to 10.0 muf 600-, 1000- and 1500-v. Permanently sealed silicone bushings are provided on all types. Transformer and Allied Products Divs., General Electric Co.

26—MECHANICAL ATOMIZER

Offers wide capacity range with oil burner air registers

The Enco Atomizer is engineered for obtaining a wide capacity range with all types of oil burner air registers without control of oil line pressure, recirculating or return oil pressure. A major advantage claimed for it is that constant fuel pressure is maintained in oil line up to the atomizer to permit equally efficient atomization over entire load range.

It is also stressed that the wide range in capacity is obtained within atomizer by regulation of areas in orifice, whirling chamber and tangential slots in approximate proportion to quantity of oil to be atomized. This is intended to insure the high velocities required within the whirling chamber to maintain proper spray angle and fineness of atomization through entire capacity range.

Other advantages cited are the discharge through the orifice of all the fuel oil supplied to the atomizer, and cleaner atomizer parts. Also, an operating range of 10 to 1 is claimed possible with constant oil pressure of 300 psig having a viscosity of 150 ssu, and 8 to 1 with 250 psig pressure, as well as a greater range with higher oil pressures. The Engineer Co.

27—FLUID SHAFT MOTORS

Have electric motor and fluid drive coupling in a single frame

These integrally designed units are intended to afford savings in both original cost and mounting area. They utilize company's regular motor frames and end bells. Said to offer advantage wherever loads require smooth acceleration, protection from "jamming" and shocks, or are difficult to start, they are intended for installation on conveyors, extractors, and bridge and trolley drives on cranes, winders and mixers.

Loads that are tough to bring up to speed are accelerated easily with these fluid shaft motors, it is pointed out, because the motor is practically up to speed before load is applied, making it possible to use motors closer to actual horsepower requirements. A saving in power is thus credited to the reduction in starting current. Starting and operating shocks are

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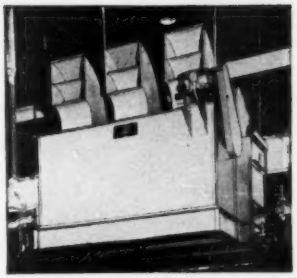

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Any high pressure condensate that remains liquid is carried to the vapor condensate return header by a drain tube that also gives off its heat into the air stream.

The vapor condenses in the lower coil. Its condensate is kept at a high level in the return leg by a wier in the return header so that all its heat is made useful and it is sub-cooled by contact with the coldest air entering the heater. Vacuum condensate return to boiler is vapor free.

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HOW IT SAVES IN UPKEEP: — Condensate flow is even, vapor free, easily handled. No sudden surges of condensate in starting. No hammering, no hard wear and tear on system. Properly engineered for the job, final air temperatures are not excessive; heat easily directed where needed; no flashing of low pressure condensate. Heaters are self-draining on shut-down. Heaters are strongly built; all coils including the condensate drain tubes are hairpin bend, stress relieving. Use thru four heating seasons has proven these advantages in large scale plant heating.

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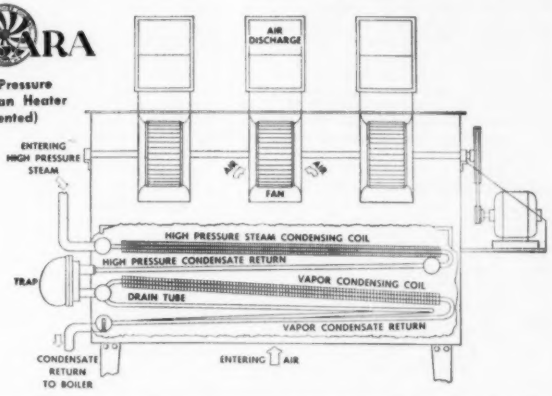

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The information in this book is arranged in question and answer form. This book is not an elementary catechism nor is it confined to the A B C's. It is designed to help you solve those knotty problems which arise from day to day and demand a definite answer on the spot. It covers several hundred problems which are likely to come up in your work and supplies such complete, concise answers that you will find it a mighty useful addition to your engineering book shelf.

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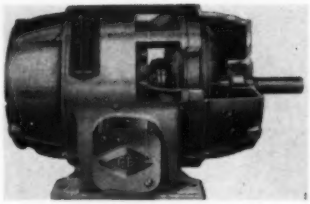


absorbed in a cushion of oil, it is stated.

Motors are available in standard foot mounted, or round body frames. All units can be mounted horizontally or vertically or with NEMA flange and face type end bells. Sizes include ½, ¾, 1, 1½, 2, 3, 5, 7½ and 10 hp units in all types. Reuland Electric Co.

28—IMPROVED QUONSETS

Are designed to permit faster erection, more strength

Compared with previous models, the new Quonset structure contains fewer but sturdier parts in the framework. The new design in the popular 40 by 100 ft size can be erected in 25 per cent less time, according to manufacturer. Frame construction is simplified by a new type of bridging between ribs. It consists of quickly-installed channel sections connecting adjoining ribs horizontally, like a ladder's rungs. Their function formerly was served by an intricate, web-like system of lighter members.

Greater structural efficiency—and roof line—is said to result from a change in manner of applying corrugated steel sheets to the framework members. These have a groove into which nails can be driven. Side sheets with corrugations horizontal, rather than vertical, are nailed to purlins extending two inches above ribs. Stran-Steel Div., Great Lakes Steel Corp.

29—GRINDING WHEELS

For grinding, sanding, deburring, cutting-off and finishing

Fibrex Red Wheels are a new type of synthetic resin bonded grinding wheel of extra strength and durability, manufactured from laminated sheets of cotton fibre filled with abrasive grain. Their chief field of application is between that of heavy grinding and light sanding.

They are offered in 7 and 9 in. depressed center type for use in portable disc sanders and right angle type portable grinders and in straight wheels 6, 8, 10 and 12 in. by ⅛ in. thickness for cutting-off and general purpose use. Slightly flexible, the Fibrex Red Wheel is designed to allow a certain amount of side pressure without risk of wheel breakage and to cut fast and clean without fraying or tearing out at the edge.

These wheels are said to have advantages for weld grinding, particularly on stainless

steel and for clearing up rough, ragged surfaces on structural steel work, fabricated metal parts. They cut a variety of materials, including most metals. Simonds Abrasive Co.

30—GRAVITY CONVEYOR

Has ¾ in. OD rollers on ball bearings, 14 rollers per foot

This conveyor provides gravity power for conveying small items by furnishing practically a continuous bearing surface, adaptable for handling small objects, cans, bottles and boxes. It can be used as a

portable conveyor unit or permanent installation in processing plants and similar industries.

It is especially useful for small parts which would fall between rollers of conveyors using large diameter rollers. Also handles tin cans, since the chime rides the rollers without catching. Available in standard 11½ in. overall, or 4½ in. overall, but can be built to order. Metzgar Co.

31—PERIPHERY MARKER

For use on outer circumferences of pipe, tubing, axles, shafts

Cast in one piece from a tough grade alloy aluminum, the Luminum-Line Periphery Marker is 50 per cent lighter than former model, but said to withstand harder wear and longer service. The new holder is fitted with floating springs for retaining stamps, and channel beading around stamp slots to prevent off-angle hammer blows.

Because of the special casting method, the cost of this new marker is lower, and since standard letter and figure stamps can be used on many applications, the overall cost of stamps is also kept at a minimum. Holders are furnished with one or two rows of stamps, and a variety of handles are available. M. E. Cunningham Co.

32—SMALL COUPLING

Has rubber center for longer service, better power transmission

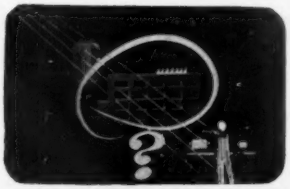
The Mighty Midget—an all-rubber-center coupling is designed for improved power transmission in fractional horsepower

motors. Its Neoprene center member gives a service life as much as ten times longer than many couplings in its particular power range, according to company.

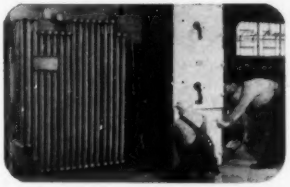
Flexing caused by misalignment is ab-

What do you gain from BETTER POWER DISTRIBUTION?

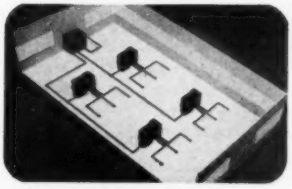
See this film and find out!



1. "MODERN INDUSTRIAL POWER DISTRIBUTION" is a slidefilm prepared by General Electric to promote a better understanding of power distribution, its importance and its cost. Easy-to-follow diggrams (above) keep this sound slidefilm . . .



2 . . . from being needlessly technical. It's invaluable in planning modernization intelligently. Much emphasis is given to the hard, practical aspects of power distribution like flexibility and ease of installation (above). But, the high point of the film is the way . . .



3 . . . it dramatizes Load-Center Power Distribution (above). Convincingly, the audience sees how a large power system is broken up into a number of small independent systems so that a failure in one system will not affect the others.

4. The film shows how load center substations are like "building blocks" (above) and can be added whenever and wherever needed. Cost-conscious executives looking for ways to reduce maintenance of distribution equipment will be interested in . . .

5 . . . the outstanding installations of fully enclosed switchgear (above). In fact there's hardly an idea in this film that won't appeal to the men you depend on for power savings. To convince you of this, we'd like to send you this helpful . . .

6. POWER DISTRIBUTION MANUAL . . . FREE! It's packed with specific data you'll want! Don't fail to send for your copy now. [The complete program consists of the 35mm slidefilm, 33⅓ RPM record, manual and booklets.] MAIL THE COUPON TODAY!

FREE *to business management!*

General Electric Co., Section D684-15
Schenectady 5, N. Y. *Attach to your business letterhead*

☐ Please send me a complimentary copy of the G-E Load-Center Power Distribution Manual (GES-3411).

☐ I'd like to borrow the sound slidefilm for showing to my organization.

Name _____ Title _____

Company _____

Street _____

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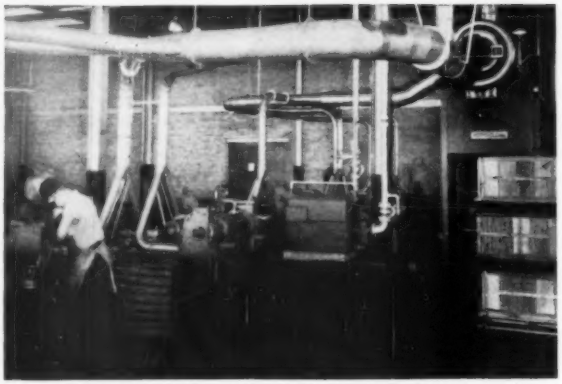
GENERAL ELECTRIC

ROTO-CLONE gives dust a One-Way Ticket



Battery of stand grinders used for foundry snagging operations is served by two Type D Roto-Clones.

DUST can't linger here to cloud the atmosphere, foul-up equipment and irritate workers. The moment it is generated, it's on its way out via Roto-Clone*.

This battery of stand grinders used for snagging castings is served by two Type D Roto-Clones installed back to back. Note the compactness of the installation. Location of the Roto-Clones at dust source eliminates long, costly pipe runs.

Constant efficiency, uniform air volume, small space requirement, low cost and ease of installation—these are the features of the Type D Roto-Clones that have made this unit a leader in the industry's winning battle over dust.

A Type D Roto-Clone Dust Control System may be installed as a central type with main duct and branch connections (as pictured), or as an individual unit serving a single dust-producing operation. For complete information, call your local AAF representative or write direct to:

IT'S A FACT! More grinders are exhausted by the Type D Roto-Clone than any other type of dust collector. Bulletin No. 272 A tells the story. Write for it now!

MEMBER AIR FILTRATION EQUIPMENT

AMERICAN AIR FILTER COMPANY, INC.

228 Central Avenue, Louisville 8, Ky.

In Canada: Darling Bros., Ltd., Montreal, P. Q.

**Roto-Clone is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

AAF

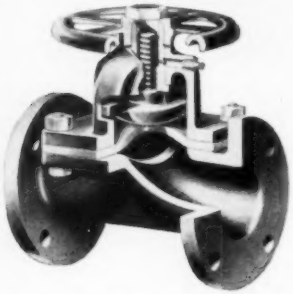
ROTO-CLONE®
DUST CONTROL EQUIPMENT

sorbed by the entire center member rather than by sloppy fit of pins, the designers claim. The tight fit of the coupling pins, when pressed into the rubber center member, is said to eliminate noise and vibration, resulting in quieter, smoother operation. Shock loads are cushioned, resulting in longer bearing life and lower replacement costs. Among many applications for the Mighty Midget are power tools, pumps, fans, dairy machinery, bottling equipment, packaging machinery, and sorting equipment. Morse Chain Co.

33—PLASTIC DIAPHRAGM

Is intended for use in valves handling sulfuric acid

The development of a new plastic diaphragm for use in company's diaphragm valves is said to make possible the handling of 66 deg Baumé sulfuric acid without the leakage, dripping or sticking problems often encountered in valving it.



Manufacturer plans to furnish these valves in sizes from ½ through 4 in., with a choice of cast iron, cast steel, Durimet, or glass lined bodies. All but the glass lined will be available with flanged or screwed ends, the glass lined being available only with flanged ends. All sizes are suitable for pressures to 100 psi, and temperatures to 125 F. Hills-McCanna Co.

34—STORAGE TANKS

Bolted steel type, have capacity range from 2900 to 45,900 bu

Bolted steel storage tanks have been adapted to meet the growing problem of storing miscellaneous produce. They can be used to store not only grains, but being tight, also provide excellent storage for

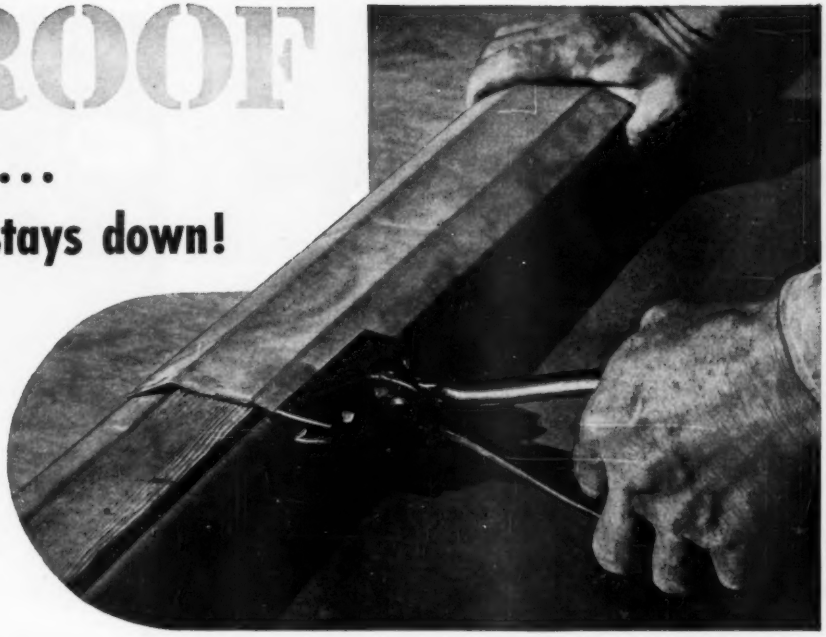
vegetable oils. Manufacturer reports that these tanks are erected in two days or less and may be knocked down, moved and re-erected on a new site. Tanks are fireproof, and rubber gaskets used in their erection afford protection against rodents and moisture. Black, Sivalls & Bryson, Inc.

35—POWER WHEELBARROW

Features improvements for broadening its industrial use

Recent improvements on the Moto-Bug, a power-wheelbarrow are intended to increase the versatility of the machine. It can be equipped with an optional 4-ft stake platform body that is interchangeable with the 10-cu ft capacity hopper body; an optional riding step for the operator is available, and a dual wheel has been placed on the direct steering mech-

This ROOF stays up... its cost stays down!



Applying batten seam Monel roof on new Ford Motor Company research building. Entire roof is Monel.

Monel Roofing Sheet gives you roofs and roofing parts that are good for the life of the building. Yet their cost is surprisingly low.

How many times have you wished for a metal that would just about eliminate roofing repairs?

Then take a tip from major industrial organizations who have found, and installed, such a metal.

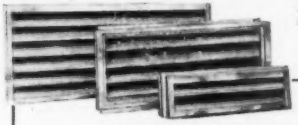
The metal is *Monel** . . . an alloy consisting of approximately ⅔ nickel and ⅓ copper.

Men who know metals, can tell you that Monel is 100% rustproof and highly resistant to corrosion by acids, alkalis and salts. This explains why Monel roofing survives so well in atmospheres contaminated by smoke, salt air and industrial fumes.

That corrosion resistance is backed up by the high mechanical properties you need in a roofing metal. Monel resists severe stresses and wear. It doesn't buckle or crack at extreme temperatures.

Monel provides a way to drastically cut your yearly outlay for roof maintenance. The proof is in its past performance. Monel roofing installations date back to 1910 . . . and they are *still in good condition!*

Before you install any part of a roof, investigate Monel. Because of its strength and workability, its installed cost is reasonable — even surprisingly low.



MONEL *cuts Louver Sheet Thickness 25%*

Here's how Monel makes possible substantial reductions in the sheet thicknesses used for standard roofing parts. A large corporation needed 50 louvers in assorted sizes. By specifying Monel (with its superior corrosion resistance and high mechanical properties), it was possible to reduce the sheet thickness. Result: longer-lasting, economical louvers . . . and a 25% saving in weight. Remember, "Monel Roofing" is a broad term; it includes entire roofs as well as drainage systems . . . flashings . . . skylight frames . . . ventilators . . . louvers . . . siding . . . expansion joints . . . copings.

MONEL ROOFING

For the "Life-of-the-Building"

Send for booklet, "ONE METAL ROOF"

It shows typical installations, tells about Monel's many advantages, cites long-service records. Included is a "test-it-yourself" sample of Monel Roofing Sheet.

EMBLEM OF SERVICE

INCO TRADE MARK

Architectural Section
The International Nickel Company, Inc.
67 Wall St., New York 5, N. Y.

Please send me a copy of "ONE METAL ROOF" and the sample of Monel Roofing Sheet.

Name.....
Title.....
Company.....
Address.....
City.....State.....

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THE INTERNATIONAL NICKEL COMPANY, INC.

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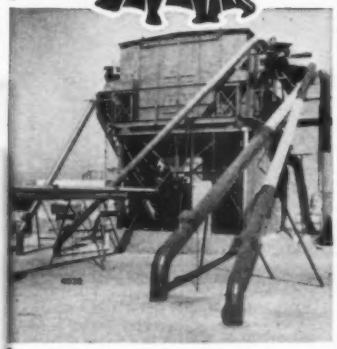
67 Wall Street, New York 5, N. Y.

DUST TURNS TO $$ THE SLY WAY



Sly Dust Filter on roof of the Quaker Oats Plant at Akron, Ohio. Pipes shown carry dust-laden air from grinding apparatus to filter.

Dust is simply a product suspended in air.

In many industries it is being reclaimed, packaged, and sold at substantial profits; e.g., rock products, milling grains, cosmetics, soap powders, etc.

In other industries, where it has no value, collection pays attractive returns by preserving health of workmen, providing better working conditions—cleaner plants—cleaner products—and by reduction of operating costs.

HAVE YOU EVER INVESTIGATED

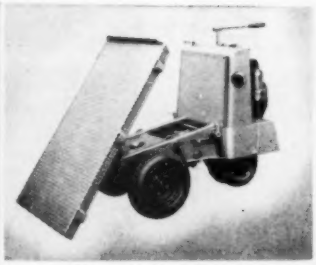
—the possibilities of dust control for your plant? Simply write us about your dust problem, and we shall be glad to advise fully—no obligation. There are thousands of Sly installations collecting over 100 kinds of dust. No doubt, our long experience can be of help to you. With our reply we'll send you Bulletin 98—a 24-page booklet showing how net income has been increased by dust control.

Pioneers & Leaders

THE W. W. SLY MFG. CO.

4600 Train Avenue • Cleveland 2, Ohio

New York • Chicago • St. Louis • Philadelphia
Detroit • Minneapolis • Birmingham • Cincinnati
Los Angeles • Rochester • Toronto



anism. Adding the flatbed platform gives the machine a 1200 lb. capacity for truck handling loose loads, skids and bins. Also, the platform body may be tilted for unloading.

In connecting the positive steering hand lever to a dual rear wheel, a differential action is credited with providing more ease in guiding and spotting. The machine is powered by a standard make, 4- hp gasoline engine, at speeds from 1½ to 4 mph in forward and reverse directions. All wheels have traction tread pneumatic tires. Thirty-three in. wide, the Motor-Bug clears doorways, narrow aisles and will turn in its own length. Kwik-Mix Co.

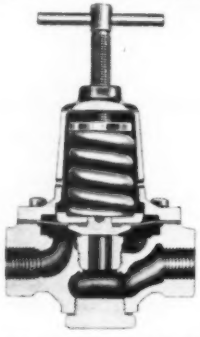
36—"MAGNETIC" ADHESIVE
Is developed for pre-cementing of many materials

H-511 Ubabond, a synthetic rubber cement, is described as "magnetic" in behavior. Surfaces pre-cemented with it can be joined together at a later time, on an assembly line, or after shipping to point of use, without loss of adhesion efficiency, according to manufacturer.

Upon application the adhesive dries to a non-tacky condition after 15 to 30 min at room temperature. When pre-cemented surfaces are to be joined, reactivation is accomplished by heating the "dead" surfaces under infra-red, steam or dry heat, or by brushing or spraying a solvent on the pre-cemented surfaces. H-511 Ubabond is intended to provide a strong and permanent bond and may be used on fabrics, leather, glass, synthetic rubber, many resins, paper, wood, pliofilm and many metals. Union Bay State Chemical Co.

37—DIAPHRAGM VALVE
Is engineered for high volume relief without blowdown

The Series 62-A line of diaphragm relief valves is described as suited to lines carrying air, cold water, oil, insecticides and similar liquids at pressures up to 250 psi. Operation is said to be simple, positive and automatic. When pressure exceeds the



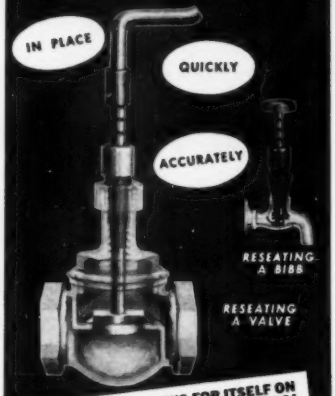
relief setting, diaphragm and valve seat are raised, opening valve and releasing air or liquid through outlet port. Surplus liquids can be discharged to supply tank by piping the outlet port.

All parts in contact with the air or fluid handled are brass. Synthetic rubber diaphragm, reinforced with nylon cloth, is said to be resistant to oil insecticides. Diaphragm extends to extreme outer edges of body and bonnet.

Regulating springs are available in several sizes for relief pressure ranges from

RESEAT VALVES AND BIBBS

IN PLACE
QUICKLY
ACCURATELY



PAYS FOR ITSELF ON FIRST 2 OR 3 JOBS!

Don't junk expensive globe or angle valves, bibbs, fixtures—reseat them! Order Skinner *Valve and Bibb Reseater*. Easy to use. Guaranteed cutters leave seat glass-smooth, level, tight.

¼" to 2"	$32.50
2¼" to 3"	$48.00

M. B. SKINNER CO.
SOUTH BEND 21, INDIANA, U. S. A.

NEW-AMAZING
PORTABLE BELT BOOSTER

STYL-O-VEYOR JUNIOR

Completely portable the Styl-O-Veyor Junior has been built to give long trouble-free service. It incorporates all the features industry demanded, plus many more. It will keep loads on the move without stop. Write now for bulletin HP20-1A to find out more about it.

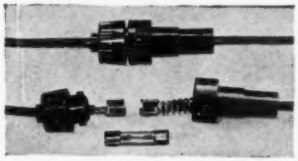
ISLAND EQUIPMENT CORP.
Brewster Rolls Royce Building
27-01 Bridge Plaza North • Long Island City 1, New York

2 to 15 psi up to 125 to 250 psi, also 5 to 125 psi. Valves come in ⅛ to 1 in. pipe sizes. C. A. Norgren Co.

38—FUSE HOLDER

For in-the-line service in electrical, electronic equipment

This fuse holder utilizes the principle of a tube socket contact of proper diameter. Positive contact is said to be assured by attaching the wire lead to the socket-type contact by a solderless crimp connection, thus making these two parts an integral unit. Considerable savings in assembly time are claimed possible by this method of assembly.



After three insertions of a 0.253 in. (plus or minus 0.0005 in.) dia pin there is a maximum voltage drop of five millivolts at 20 amperes when measured with a 0.247 in. (plus or minus 0.0005 in.) silver plated copper pin. Maximum strength is obtained in the design of the key of the molded cap, intended to lock securely or unlock. Hugh H. Eby, Inc.

39—TUBE FITTING

Is clinch type, for use with any metal or plastic tubing

Marketed under the trade name Swagelok, these fittings are designed to provide leak-proof seals at three points. Two ferrules and a threaded chuck clamp around a tube with virtually no effect on the inner walls, thus leaving the flow of liquids or gases completely unimpeded according to manufacturer, and tests have indicated that tubing will burst before these fittings will leak.

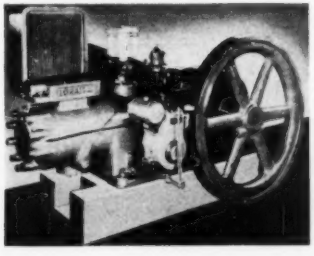
A Swagelok is slipped onto the end of a tube and given one-and-one-quarter turns with any standard wrench. The resulting assembly is then ready for service. No damaging torque or twisting is transmitted to the tube during this brief tightening operation, it is pointed out. Swageloks may be obtained in Monel, brass, aluminum, steel and stainless steel, Types 303 and 316. Connectors, unions, elbows and "tees" are all being produced, in a range of sizes that permit their use with tubing ⅛ to 1 in. OD. Crawford Fitting Co.

40—HORIZONTAL ENGINES

Two-cycle, single cylinder type, have condenser cooling system

The Lorain Model R and Model A Engines are identical except that the Model R has a 12 in. cylinder bore and 13 in. stroke, and produces 45 bhp at 325 rpm, and the Model A has a 13-in. bore and stroke and produces 55 bhp at the same speed. Both new models have tapered roller bearing crankshafts and auxiliary shafts. Wet-sleeve cylinder lines of alloy cast iron are used to assure long life and easy replacement.

The Model R operates on natural gas fuel only. Model A can be operated as a cold-starting, full Diesel or readily converted to burn natural gas or butane. With condenser-type cooling system, make-up water is said to be negligible. Standard equipment includes Twin Disc Clutch, Pierce Governor, Air Maze oil-bath cleaner, McCord Lubricator and built-in 7½ hp Lorain gasoline starter. Over-all dimensions are: length, 110 in.; width 74 in.; height, 68 in. Shipping weight is 8275 lb. White Roth Machine Corp.



41—PORTABLE PYROMETER

Is multi-circuit instrument for temperature measurement

The Alnor Type 1200 Portable Pyrometers are precision built, multi-circuit, direct-reading instruments designed for accurate and precise temperature measurements at many points in rapid succession. They are recommended for making tests involving the temperature rise of various portions of an electrically operated device, or repetitive tests on a group of devices.

Two switch capacities are available, 8 and 17 circuit. Standard switches are designed for "overlapping" contacts, but the 8-circuit switch is also available in a "non-overlapping design. Also available are double range pyrometers with automatic compensators adjusted for high ranges only. Type 1200 instruments can be calibrated for any standard thermocouple alloys, manufacturer reports. Housed in walnut case. Prices start at $150. Illinois Testing Laboratories, Inc.

42—EYE WASH FOUNTAIN

For preventing injury to eyes by chemicals or foreign matter

Much of the more dangerous aspects of workmen accidentally getting chemicals and other foreign matter into their eyes or skin can be avoided with a new eye wash fountain and specially designed shower. One model, a fountain with two specially designed angle stream heads,

WHEN you buy a steam trap, don't just consider the price tag cost. The purchase price never gives you a true cost picture. Always figure the installed cost, and immediately you'll see a big difference in the price. The conventional trap requires costly fitting and labor to get it installed. But Super-Silvertops fit snugly, saving up to eight fittings plus 60 minutes of installation time.

And also consider the cost of operating those steam traps. Time studies demonstrate that Super-Silvertops' design makes for ease of inspection and servicing . . . 45 minutes less to replace a part or clean.

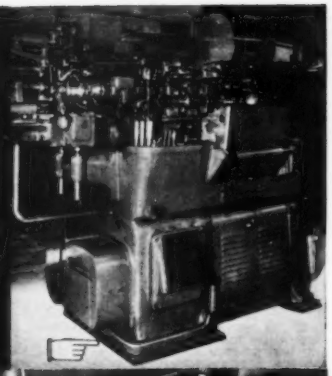
On your next order, figure the installed cost. You'll buy Super-Silvertops every time. For more information on cutting costs, write for the book, "Solving Steam Trap Problems."

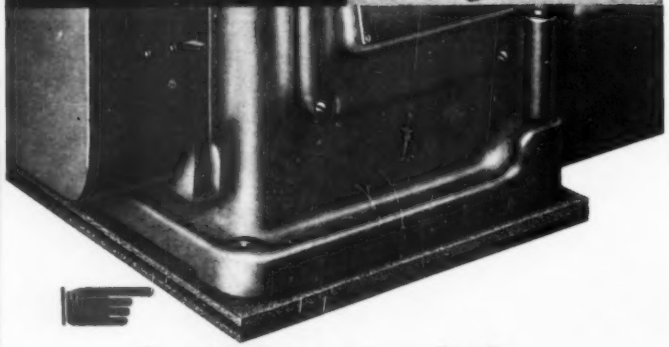
THE V. D. ANDERSON COMPANY
1939 West 96th Street • • • Cleveland 2, Ohio

SUPER-SILVERTOP STEAM TRAPS

Telechron

SOLVES
Machine Anchoring
PROBLEMS





by "Mounting It On

UNISORB"

This leading clock manufacturer cut installation time materially when UNISORB machine mounting came into the picture.

They cut transmitted machine vibration 60% to 85%.

They eliminated the need for old-fashioned, destructive floor-drilling in most instances—*because UNISORB requires no bolts or lag screws.*

Your company can do the same. Clip and mail coupon *today.*

THE FELTERS COMPANY

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Offices: New York, Philadelphia, Chicago, Detroit, Cleveland, St. Louis
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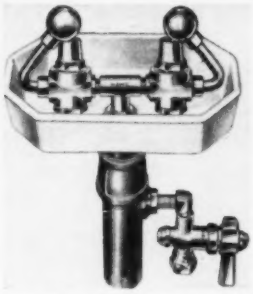
directs a double stream of clean water into the eyes, at a simple twist of the control valve, to dilute and wash away foreign matter. The other model combines the



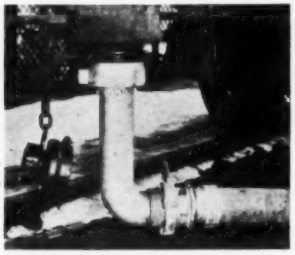
fountain with a high-volume shower which delivers a sudden drenching bath to dilute and wash away chemicals before they can penetrate clothing. In this model the fountain is operated by a foot treadle while a metal cord is pulled to operate the shower.

Developed in cooperation with safety engineers of a large chemical plant, the eye wash fountain is designed to instantly put a maximum of water directly into the eyes without danger of further injury. This is accomplished by a pre-determined setting of a highly sensitive, automatic regulator which controls both pressure and volume of the water. Haws Drinking Faucet Co.

43—UNLOADING FITTING

For universal tank car use, it weighs less than 10 lb

Principal advantage of the Cornell Tank Car Unloading Fitting is said to be the ease of handling and speed of hook-up. Its light weight enables one man to lift it in place and tighten the collar by hand.



Made from cast aluminum, the fitting has a high tensile strength to withstand hard usage. The fitting is said to be practical for most types of unloading, and to successfully meet rigid tests for handling liquids under most conditions.

The fitting is available in lengths of 10 and 15½ in. A standard thread is used in the fitting collar for universal adaptability on all tank cars. An undercut in the collar locks the oil-proof gasket in place to prevent loss or damage. The collar stays up in position ready for use.

The standard tank car fitting is made with a 3 in. outlet pipe thread, and is also available with a 4 in. outlet pipe thread if desired. Reduction fittings may be added. The standard fitting is made of cast aluminum, but is available to order from any cast metal. The unloading fitting is also said to be adaptable to rapid coupling devices. The Mead Cornell & Co.

44—CALCULATING MACHINE

Offers automatic addition, multiplication, division, subtraction

The streamlined, "color engineered" Calculator is completely automatic in operation and designed to eliminate operator effort and fatigue. It is said to permit the operator to write the answer to one problem while the next is being computed. Special operating features facilitate han-

(Continued on page 64)

Bulletins on Current Plant Problems

(Continued from page 28)

design features and a series of cutaway diagrams show governing and control systems. Also included is 2-pp spread on helical gears for applications using geared turbine drive equipment. De Laval Steam Turbine Co.

140 Seals for Pump Shafts—Four-pp Form S-13 features a positive liquid seal for rotating shafts, giving advantages, dimensions, information required for quotations. Photo shows seal in operation and large sectional drawing illustrates design principles. A 2-pp insert contains testimonials from plants where use of these seals is credited with promoting greater efficiency and lower maintenance costs. Monogram Mfg. Co.

141 Automatic Circulator—This 8-pp bulletin features company's precision built automatic circulator designed for pumping high head smoothly. Seal design, impeller assembly and motor bell housing are described and illustrated and full specifications given. Also included are illustrations and data covering a flow control valve. White Pneumatic Corp.

142 Centrifugal Blowers—Bulletin 120-B-14 is company's revised booklet on blowers and exhausters. Discusses centrifugal advantages and the operating characteristics of manufacturer's units. Design and construction features of sing'e stage and multi-stage units are explained and illustrated with photos, cross-sections, diagrams, curves and exploded views. Regulation is also discussed and many photos of typical installations are included. Roots-Connersville Blower Corp.

MAINTENANCE

143 High Pressure Cleaners—Equipment for high pressure "steam" cleaning is the subject of 16-pp Catalog 36, which includes an explanation of high pressure cleaning. Text covers design features of the equipment, its applications in heavy duty industrial work, building maintenance and shop and tank cleaning. Describes and illustrates types and sizes and provides complete details on construction and operating characteristics of the units. Also contains tips on selection and installation, specifications, and cost of operation. Many applications are pictured. Malsbury Mfg. Co.

144 Wall Washer — This pocket-size folder explains briefly a mechanical wall washing process and illustrates equipment used. Discusses efficiency, low cost, lack of messiness and portability of washer. Quaker Maintenance Co.

145 Steel Scaffolding — "How to Do Overhead Work Safely," is the title of 4-pp Bulletin PTS-13 on steel rolling scaffolds which contain only four basic parts and can be erected to almost any height. Text covers main advantages of system. Photos show large and small scaffolding jobs and sketches illustrate tubes, couplers and castor. The Patent Scaffolding Co., Inc.

RUST AND CORROSION PREVENTIVES

146 Rust Preventives—Bulletin AD2466 is a 16-pp booklet featuring company's line of rust preventives. Discusses water displacement characteristics in rust prevention, the selection of preventives and several methods of application. Also describes company's testing methods and gives outstanding properties of rust preventive line, giving specific information on eight grades. Recommendations for application for different exposure conditions and coverage are presented in tabular form. Illustrated with photos showing application methods, test results. Standard Oil Co. (Ind.)

147 Rust Preventives Blown—Described as an "all star line-up of rust preventives" are company's 11 rust preventive products presented in this 8-pp booklet. It lists and discusses the use of each of these products and contains a chart outlining their physical properties and providing information as to thickness and type of film, amount of coverage and other data. Photos show how these rust preventives stand up under severe testing. E. F. Houghton & Co.

148 Magnesium Anodes—Opening with a discussion of magnesium's properties in cathodic protection, this 12-pp bulletin describes and illustrates applications for magnesium anodes on pipe gathering lines, tanks, cables and underwater structures. Explains current requirements for cathodic protection, number of anodes needed to supply current, types of anodes best suited and location of anodes. Also tells how to install anodes and the importance of backfill. Describes several anodes in detail. Dowell Inc.

149 Protective Coatings—Bulletin MC-3, 4 pp, gives facts on four groups of coatings developed for corrosion control, chemical resistance and heavy-duty industrial painting. Essential details on various formulations are briefly outlined and, as evidence of their chemical resisting qualities, cases are cited where these coatings ended tough maintenance problems. Illustrations show their use in oil refineries, chemical plants, paper mills and food processing plants. Properties and uses of several coatings are discussed individually. United Chromium, Inc.

150 Protective Coatings—The "Prufcoat Proof Packet" is a standard-size, easily-filed folder of essential information covering use and specifications of firm's industrial paints. Contains reports from outside testing laboratories, case histories, plans for analyzing painting maintenance costs, price list and catalog information. Prufcoat Laboratories, Inc.

151 Heavy Duty Paint—An industrial plastic coating developed to resist water, alcohols, many acids and alkalis and gasoline and oils is described in this small 4-pp folder. Lists advantages, applications, available colors and gives coverage. Stonhard Co.

WATER PURIFICATION

152 Water Conditioning—Bulletin WC-100, 8 pp, concisely outlines company's water conditioning products, services and background. Explains its scope of activities in the boiler plant, process work and general industrial fields and is illustrated by some of company's large installations of hot-process and zeolite softeners, demineralizers, clarifiers and filters. Graver Water Conditioning Co.

153 Compression Distillation—This 4-pp bulletin on compression distillation, explains and illustrates how it works and discusses its low cost, efficiency, simplicity, and other advantages. Also discusses its industrial applications and includes photo of a 10,000 gal per day still. Arthur D. Little, Inc.

SAFETY, SANITATION

154 Fire Extinguishing Equipment—Twenty-pp Form F 6302 illustrates, in color, company's complete line of dry chemical fire extinguishers, piped systems, large stationary units, fire trucks and trailers. Also features charts showing characteristics of approved hand fire equipment and comparative effectiveness graphs. Includes specifications. Ansul Chemical Co.

155 Ultra Violet Sterilizers—The protection afforded by overhead sterilizing units and water sterilizers using ultra violet as a germicide are stressed in this 6-pp folder. Describes and illustrates both the water sterilizer and sterilizing hood, telling how they work. Applications for the units in the food processing, drug, bottling industries are discussed and illustrated. Hanovia Products, Inc.

156 Non-Slip Floor Plate—Eight-pp Form 2356 gives fabricating data and sizes and thicknesses of an abrasive rolled steel floor plate described as non-slip even on steep inclines. Several of its many "safety" applications are illustrated. Alan Wood Steel Co.

157 Gloves for the Job—This small 16-pp catalog presents company's line of "job-rated" work gloves. It pictures and describes single palm canvas, jersey, double palm canvas, fleece palm with canvas back, hot mill, terry cloth, leather palm, neoprene, plastic and natural rubber-covered canvas gloves as well as chore and tick mittens. Brookville Glove Co.

FUEL OIL, LUBRICANTS

158 Sludge Remover — This is a 6-pp folder on manufacturer's fast-acting fuel oil additive developed for dissolving sludge in oil storage tanks and the entire system. Explains how this solvent improves operating efficiency of heating system and reduces cleaning jobs by making the sludge burnable with the oil. In addition to describing the physical composition of the solvent, how it functions and results obtained, the folder contains many photos, including enlarged micro-photos showing how the solvent disperses sludge deposits. An additive for emulsifying free water in the fuel oil system is also described. E. F. Houghton & Co.

159 Lubrication Guide—This small 16-pp booklet describes in detail the properties of nine lubricants, giving recommenda-

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Bulletins on Current Plant Problems

tions for their most efficient use on tractors, trucks and other equipment, and illustrating service performance characteristics. Swan-Finch Oil Corp.

MECHANICAL POWER TRANSMISSION

160 Speed Reducers — This 8-pp booklet presents actual case histories showing how installation of company's worm-gear speed reducers effected savings in space, weight and money. Includes photos of available models. The Cleveland Worm and Gear Co.

161 Rugged Bearings — The outstanding features of company's resin bonded fabric bearings are presented in 4-pp Form HB-542 which stresses their resiliency under excessive pressure and illustrates, by sketches, comparative installation clearances, effect of heavy impact, effect of misalignment, and shifting journal pressures on these and other types of bearings. Text covers use with shock loads, dimensional stability, lubrication with grease or water, underwater installation, and resistance to corrosive and abrasive conditions. Gatke Corp.

162 Babbitted Bearings — Precision-built solid and split babbitted bearing are pictured and described in 6-pp pocket-size Folder 814. Stock sizes are listed; also described briefly are three types of bearings for heavy duty service. The Jeffrey Mfg. Co.

DUST CONTROL, HUMIDIFYING

163 Dust Control—Bulletin 909A, 28 pp, covers the necessity and economy of controlling industrial dusts and the application of dust control equipment. Describes, illustrates and gives specifications for manufacturer's cloth screen collector. Presents application and engineering data and photos of several installations; also discusses briefly some of the company's other dust control equipment. A questionnaire is included outlining essential information required for analysis of individual plant dust control problems. Pangborn Corp.

164 Industrial Humidifying — Desirable features of industrial humidification are cited in 4-pp illustrated Bulletin 127 covering manufacturer's centrifugal humidifiers. Text covers their economy, design simplicity, and flexibility; explains principle of operation. Three models are described and illustrated by dimensional drawings. Controls for installation on humidifiers are also presented. The Bahnson Co.

HEATERS, PROCESS HEATING

165 Low Pressure Heating Units—A 15 psi steam boiler and a 40 psi hot water or fluid heater are presented in this 8-pp bulletin. Discusses their application in the heating of small plants and in the generation of steam for small industrial requirements. Heater shell and internal firebox construction are also described. Includes capacities, specifications, dimensional drawings. Black, Sivalls & Bryson, Inc.

166 Condensate Drainage — How laundries, food processing plants, textile mills and other industrial plants utilize company's drainage control system for increasing production and improving quality with steam processing equipment is described and illustrated in detail in 24-pp Publication 3250. Features an illustrated discussion covering operation of system, including function of jet loop. Includes specifications, dimensional data, on standard and high differential units. Cochrane Corp.

INDUSTRIAL WASTE TREATMENT

167 Industrial Waste Handling—Manual 149, 24 pp, on processes and equipment for sewage and industrial waste treatment is indexed and classified by treating processes. It covers manufacturer's latest engineering developments in activated sludge, blo activation, jet aeration, mechanical aeration, screening, grit removal, pre-treatment, sedimentation, trickling filters, sewage and sludge pumping, waste treatment and recovery. Flow sheets and installation views are included. American Well Works.

168 Bar Screen — How manufacturer's bar screen is built for efficient removal of trash and large solids from water and sewage when used in sewage and industrial water treatment plants is explained and illustrated by photos and drawings in 4-pp Folder 2227. Illustrations include view from operating floor, detail of control and rake action. Complete specifications included. Link-Belt Co.

MATERIALS

169 Alloy Steel—"For Longer Wear, Less Repair," is a 36-pp brochure (Form AD135) describing Jalloy, a new alloy steel capable of being heat treated to excellent physical properties, and being used in industries where abrasion and impact resistance are major factors in the service life of steel. The booklet features a complete and entertaining presentation of Jalloy case histories in these fields. Also included is complete technical data with tables on chemical composition, grain size, and physical properties relating to surface hardness, yield strength. Jones & Laughlin Steel Corp.

170 Corrosion Resistant Materials—Bulletin M, 8 pp, describes, illustrates and provides application information on corrosion resistant tubing formations, gasketing, coatings, lining materials and grinding and mixing equipment. Also covered are chemical stoneware and porcelain, ceramic processing equipment and cemented-on-metal flange pipe and fittings as well as corrosion-resistant masonary. U. S. Stoneware.

171 Duct Insulation — Twelve-pp Publication IM-AI contains design data for the application of manufacturer's duct insulated materials. Their properties are described and a 2-pp illustrated section provides a detailed description of several methods of application. Covers use of coated duct insulation, flexible insulation for exterior use and finishing of duct surfaces. Generously illustrated with two-color photos and sketches. Owens-Corning Fiberglas Corp.

MISCELLANEOUS

172 Fastening Specialties — This 28-pp looseleaf manual features full descriptive and engineering data on manufacturer's line of blind rivets, anchor nuts, panel fasteners, door-retaining springs and related equipment. Industrial applications in fastening metal-to-metal, metal-to-plywood and other combinations are covered. Southern Chester Corp.

173 Daylight Control—An article on the value of daylight, originally published in PLANT ENGINEERING, is featured in this 4-pp bulletin. The article covers such points as light variability, glare, dirt on windows, and the psychological effect of daylight on plant morale. Bulletin also describes and illustrates company's aluminum awnings and discusses their advantages briefly. Rhode Island Engineering and Mfg. Corp.

174 Industrial Glassware — Attractively illustrated and highly informative, 24-pp Booklet E-24 was prepared as an aid to manufacturers who buy glass parts for use in their products. It's filled with design data of help in deciding on the general design of glass components and accessories. Text covers the melting of glassware, pressed glassware, tubing and rods, glass and metal assemblies and secondary operations. Corning Glass Works.

175 Ring Packing — Technical Bulletin TB-918, 12 pp, presents a study of company's non-extrusion ring packing for reciprocating, static and special applications up to 10,000 psi. Considers the variety of application, operation principles, design features, performance test data, and contains installation instructions. Includes photos, diagrams and dimension tables. Greene, Tweed & Co.

176 Diesel Engines—Four 2-pp bulletins, Nos. 166, 167, 167-A, and 168, give specifications, detailed information and outline drawings of manufacturer's Model 4FS-1 Diesel engines as adapted to power take-off with and without clutch, generating units and pumping units. The four-cycle one-cylinder Diesels described are rated at 15 hp at 1800 rpm and 10 hp at 1200 rpm. Illustrated by photos. Nordberg Mfg. Co.

177 Machinery on Time—A liberal deferred payment plan for the purchase of machinery is announced in Bulletin 36, 2 pp. Explains how plants can acquire airless blast cleaning, dust collecting and foundry equipment at lowest possible financing cost without dissipation of working capital. American Wheelabrator & Equipment Corp.

178 Preformed Wire Rope — Corrosion-resisting preformed wire rope of stainless steel and monel—123 types and sizes in all—are catalogued as to breaking strength

(Continued on page 66)

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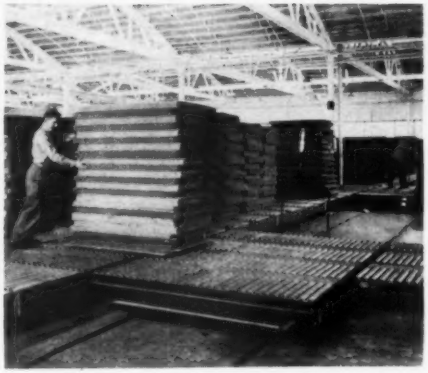

PRODUCTION is rolling along BUSCHMAN Conveyors in this noted corrugated board manufacturer's Chicago plant.

The photos show the large warehouse space in which BUSCHMAN roller conveyors have materially speeded up the hand ing time while reducing the handling costs.

This company's engineering department and Chicago Plant Manager have also commended Buschman on the trouble-free installation of such a large project.

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PE 12-49

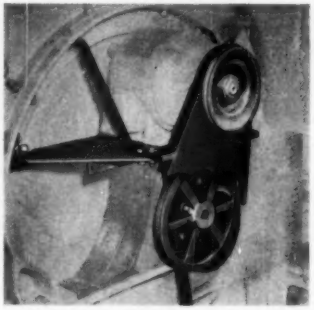
(Continued from page 60)

dling of payrolls, inventories and tax compilations. Competitively priced. Friden Calculating Machine Co.

45—INDIVIDUAL DRIVE

Is intended to eliminate line shafting, long flat belt drives

It is said that this drive overcomes many industrial plant problems, such as failing lint and dust, inefficient lighting, inadequate air conditioning, impractical machine location and low machine operating efficiency. The unit is designed to provide a 20 per cent variation in driven speeds with no loss in overall drive efficiency to insure correct speed for industrial processes under all operating conditions.



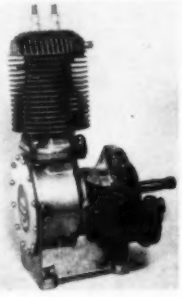
The drive utilizes a high torque 1½ hp, 1750 rpm motor driving a 5 to 1 ratio helical gear reducer through an adjustable diameter sheave and a single V-belt. Changes in speed can be made by adjusting the variable-pitch sheave on the motor. Another advantage is drive's low maintenance—a semi-annual change of oil in the reduction unit is reported to be all that's needed to keep drive in working condition. The American Pulley Co.

46—2-CYCLE ENGINE

Is engineered for lighter weight and ease of maintenance

Redesigned for increased power and reduced weight, manufacturer's single cylinder 2-cycle engine of 2 in. bore and 2½ in. stroke develops 3½ hp at 3800 rpm, and has a maximum torque of 61 in.-lb at 2500 rpm.

Its weight (less magneto) has been reduced to 12.7 lb, through the use of aluminum die-cast crankcase, connecting rod



and cylinder with cast-in cast-iron sleeve. Piston is of permanent mold aluminum alloy, having two compression rings. A forged steel balanced crankshaft is supported by two large Timken tapered roller bearings. Fuel is admitted through a die-cast rotary valve. The latest type "M T" Tillotson carburetor is used. Simplex Mfg. Corp.

47—FLOOR COATING

For giving floors a lustrous finish and non-slip surface

A resin water emulsion coating easily applied with mop, lamb's wool, alpaca pad or any clean applicator, the manufacturers of No-Slip claim it is the answer to slippery floor hazards. As an emulsion, No-Slip

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✓ *Built for heavy-duty*

For your safety campaign against dust hazards, Hoffman vacuum cleaning equipment is built for continuous heavy duty service. Sturdy construction and efficient design assure fast, thorough cleaning at low cost.

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New Products and Methods

does not present a continuous film and thus overcomes objections of many tile manufacturers to products that completely seal off the floor. It is said to seal out dirt, however.

It is especially recommended for linoleum, asphalt and rubber tile floors. Described as impervious to water, fats or greases, it may be applied to varnished wooden floors to prevent rug slippage if all previous coating has been removed. It also has been applied over painted or unpainted concrete floors.

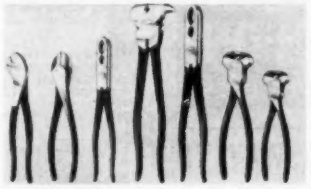
Floors coated with No-Slip may be cleaned with a mild neutral cleaner, damp cloth or mop. When a waterless cleaning process is used the floor may be buffed with fine texture steel wool. Worn traffic areas may be re-treated without removing the original coats.

The material is non-inflammable and contains no harmful ingredients, manufacturer states, adding that it carries the label of Underwriters' Laboratories, coefficient of friction rating 0.90 on linoleum and asphalt tile and 0.83 on rubber tile. Time Saving Specialties.

48—INDUSTRIAL PLIERS

Available in 15 new patterns in popular sizes and styles

Manufacturer's new pliers—some illustrated cover end cutting nippers, long and short chain nose, long and bent needle nose, duck bills, round nose, gas and burner,



fence and staple puller and battery types. Made of forged and heat treated steel with brightly polished jaw faces. Each pair of pliers is individually boxed. J. H. Williams & Co.

49—FIRE BLANKET

Is roller type, for use wherever hazard of clothing fires is present

This emergency fire blanket is recommended for chemical laboratories, oil refineries, paint spray lacquer rooms. It is designed to allow a man to envelope his body in a few seconds, cutting off air and smothering the fire. To use it, one arm is put through the blanket loop and a turn is all that's needed. The end of the blanket automatically detaches from the roller. Blanket is 80 per cent wool, 60 by 80 in.

in size—large enough to cover from neck to ankles. It is treated to make it fire retardant and mothproof. Roller assembly is mounted within a heavy gage metal container, specially designed for quick opening. When fastened to the wall the unit takes up little space. Industrial Products Co.

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Bulletins on Current Plant Problems

and weight in 4-pp Form 49-30. Strand constructions are described and illustrated by drawings, and typical uses where corrosion affects many other types of rope are listed. Macwhyte Co.

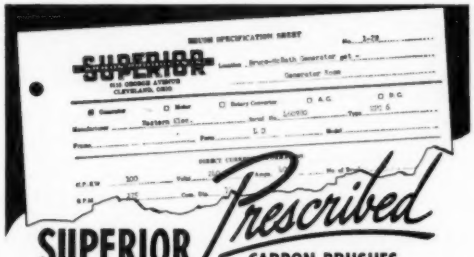
179 **Centrifuge Data**—Operating details, specifications, and application data for company's line of centrifuges is released in illustrated Bulletin 1248. Includes basic information on the centrifuge principle, maximum utilization of centrifugal force, operating features on forms and models for general and specialized industrial application. Also included are details and photos of purifiers, laboratory and portable models. The Sharples Corp.

180 **Motor Driven Controls**—Four-pp Bulletin 71 covers company's motor driven controls for supervision of process sequences, describing briefly their use in pre-determined timing, synchronizing, starting and stopping, reversing, automatic and repeat cycles, signalling and other applications. Many photos show these controls installed in fire alarm systems, dust control systems, bar bending and other machines. Other industrial applications are listed. Reynolds Electric Co.

181 **Turning Vane and Volume Control**—Bulletin 30, 4 pp, describes construction, installation and operation of a turning vane and volume control device for balancing heating, ventilating, and air conditioning systems. Amply illustrated with photos, diagrams and tables, it discusses how the unit eliminates one-sided air flow and provides volume control previously considered unobtainable with ceiling air diffusers. Also points out that fraction loss is greatly reduced with this unit. Dimensions and installation data for seven sizes ranging from 12.5 to 30 in. dia are given. Smoke test photos show how air stream is accurately controlled by adjusting regulating rod. Anemostat Corp. of America.

182 **Spray Welding**—This 4-pp catalog describes company's spray welder, a powder metallizing gun, and the spraying of powdered Colmonoy Nos. 6, 5, and 4 alloys, as well as other powdered metals. It is pointed out that this welder can be used for metallizing as well for usual Colmonoy process which combines both welding and metallizing. Several hard facing applications which have proven adaptable are also included. Photos illustrate the welder and process and a few applications. Wall Colmonoy Corp.

183 **For Better Seeing**—Here's a small folder describing and illustrating ten "local" light fixtures for focusing high intensity light directly on the immediate work area. Gives sizes, lamp requirements, colors available and tells applications for machining, assembly and inspection lighting. The Fostoria Pressed Steel Corp.



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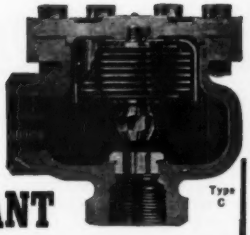

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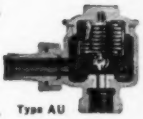

5 TYPES for Every Plant Application

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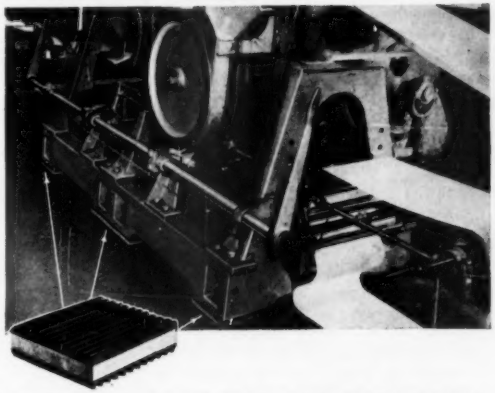

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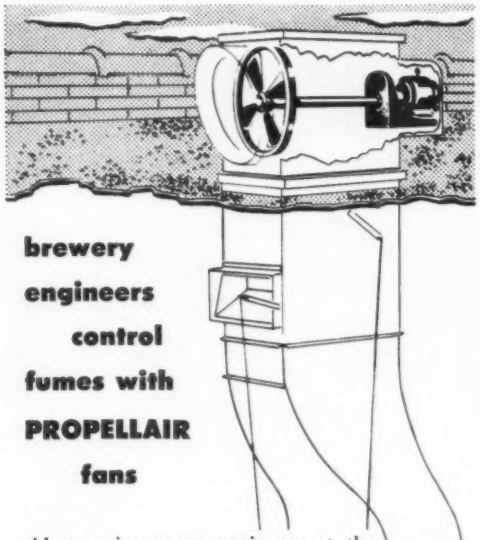

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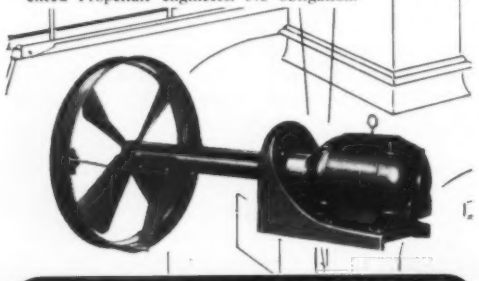

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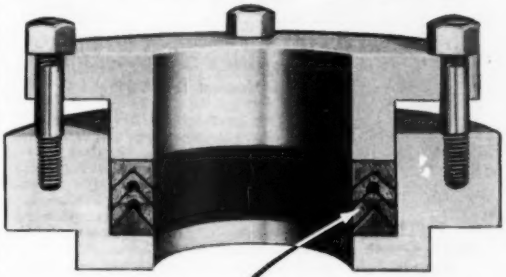

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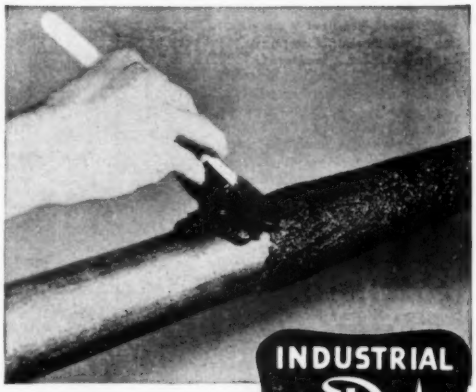

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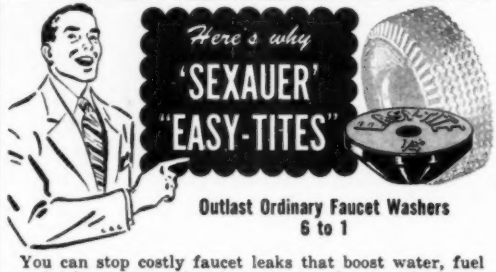

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New Books for Plant Engineers

An asterisk (*) following the title of any book described in this department indicates that the book may be purchased from the Book Department, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill.

Boiler Room Operating Data

BOILERS AND COMBUSTION 1948. Size 8½ by 11 in.; 49 pp; paper bound. Published as publication No. R-1, by the Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y. Price $2.50.

A REPORT OF the Boilers and Combustion Subcommittee of the Prime Movers Committee, published August 1949, and dealing with operating data during the year 1948. The publication covers: statement of the subcommittee: specific statements by operating companies; and statements by manufacturers. It deals with performance and failures of equipment and such accessories as: soot blowers; combustion control; fans; draft losses; availability of single-boiler, single-turbine plants; as well as coal sampling, coal weighing and efficiency calculations.

Power Plant Operation and Performance

TURBINES, CONDENSERS AND AUXILIARIES, FEEDWATER HEATERS AND EVAPORATORS. Size 8½ by 11 in.; 78 pp; paper bound. Published as publication No. R-3 by the Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y. Price $3.50.

A REPORT BY THE Turbines and Condensers Subcommittee, published in 1949 and dealing with data for the years 1946 and 1947. It contains statements by the subcommittee, by operating companies and by manufacturers on equipment listed in the title and also turbine operating and outage data, both scheduled and unscheduled.

To Help Supervisors Help People

THE SUPERVISOR'S MANAGEMENT GUIDE. Size 6 by 9 in.; 188 pp; copyright 1949; spiral flexible fabricoid binding. Published by the American Management Assn., 330 W. 42nd St., New York, N. Y. Price $3.50.

EDITED BY M. Joseph Dooher and Vivienne Marquis, prepared by seventeen operating executives and industrial specialists to assist supervisors and operating executives to plan new development in management methods for improving human relations in business.

The guide presents case studies and discussions of successful supervisory programs and techniques. It is intended as a desk manual for individual reading and for supervisory conference programs.

The book is divided into eight sections: guides to constructive work relations: morale; qualities of leadership; developing skill in communication (practices of speaking effectively to employees); conference training methods; self-analysis for supervisors; and management policy and goals. The last section is a suggested reading list.

Diesels as the Navy Views Them *

ELEMENTS OF DIESEL ENGINEERING by Orville L. Adams, Sr. Size 5½ by 8 in.; second edition; 367 pp; ill.; cloth binding. Published by the Norman W. Henley Pub. Co. Price $5.00.

DURING WORLD WAR II the author served with the United States Navy as ship repair officer in charge of maintenance, and in addition taught classes of Army and Navy personnel in Diesel engineering. The book reflects all the progress made in this field since the first edition in 1936.

It begins with chapters on Diesel definitions and fundamental engine cycles. Then follow discussions of fuel injection systems; combustion and heat distribution; rating, testing and performance; air intake and supercharging. This is followed by interpretation of Diesel indicator diagrams, then a chapter on Diesel fuel and lubricating oils, another on fuel properties and engine performance. In the appendix are tables of nomenclature, units and mathematics, discussions of combustion and heat distribution in the internal combustion engine, fuels and tests in specifying lubricating oils.

This is one of the best books in the field, for it is devoted to fundamental principles of Diesel engines and not primarily to details of specific makes of engines which are well covered in other books and in catalogs. Some knowledge of relatively simple algebra and logarithms is necessary for working the problems, but no higher mathematics is involved.

How the British Save Steam and Power

THE EFFICIENT USE OF STEAM by Oliver Lyle. Size 6 by 9½ in.; 912 pp; ill.; cloth binding. Published by His Majesty's Stationery Office, 429 Oxford St., London, England. Price 15s. Net ($2.10).

FROM THE POINT of view of fuel economy, the correct use of steam for heating and power is of such importance that Mr. Lyle, a member of the Fuel Efficiency Committee of the Ministry of Fuel and Power, was asked to write a book to give users of steam in factories the information they need in the most convenient form.

This is an intensely practical book covering the minimums of theory essential when dealing with the design, maintenance and operation of the steam plants and accessories used in industry. It includes tables and formulas needed for reference by power engineers, plant engineers and works engineers.

The book begins with a discussion of what steam is, its heating and power properties, how they are measured and how they are shown on various types of diagrams. From that point on the author gets down to such practical details of: combined power and heating systems; prevention of heat loss by proper lagging; steam distribution systems, piping and traps; efficient operation of engines and turbines; flash steam and low pressure vapor; peak loads and heat storage; evaporation, pressure water heaters; and automatic controls.

Investigation of how much heat is being used, and why, leads to the heat balance, which is well covered with many calculated examples. There is no book dealing with the saving of power and electricity, says the author, so he added chapters on this subject and also on how to go about steam saving program documented by typical examples. An appendix includes necessary steam tables, many examples, a list of references and a comprehensive index.

On Current Industrial Problems

Personnel and Management Bulletins. Size 6 by 9 in. Published by the American Management Assn., 330 W. 42nd St., New York 18, N. Y. Price 75 cents per copy of each bulletin.

GENERAL Management Series No. 144, Operating Under Decentralized Management, 31 pp, consisting of three papers and a discussion presented at the general management conference in June.

PERSONNEL Series No. 124, The Practical Meaning of Management Statesmanship, 39 pp, consisting of four papers and their related discussion of the conference held in Chicago in February.

PERSONNEL Series No. 125, What to Expect in Union Demands or The Outlook for Labor Legislation, 44 pp, consisting of five papers and their related discussion presented at a conference of the association in Chicago in February.

Strictly for the Buck Rogers Fans

BIBLIOGRAPHY OF BOOKS AND PUBLISHED REPORTS ON GAS TURBINES, JET PROPULSION, AND ROCKET POWER. Size 6 by 9 in.; 47 pp; paper bound. Published as National Bureau of Standards Circular 482, and available from the Supt. of Documents, U.S. Gov't. Printing Office,* Washington 25, D.C. Price $0.20.

THE TITLE is self-explanatory and it presents only references to publication sources under specific equipment listed. For convenience the references are grouped according to subject matter, and classified by year of publication to aid in the use of the bibliography. There is included a brief introduction on the classification and rating of jet engines.

*Government printing office sells a large variety of publications many of which are 5 or 10 cents. To facilitate purchase, the Superintendent of Documents sells, in units of a dollar, five-cent coupons which may be used when ordering publications.

POPULARITY of double-ring weddings has made ring wearing rather a common male habit. In industry, rings constitute a hazard important enough to be noticed in compensation circles. Rings that catch on hooks, bolts, nails and other projections on scaffolds or machinery can cause loss of a finger. The Ohio Industrial Commission calls such accidents almost epidemic.
Science and Appliance—OSU Research Foundation.

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removal of the pieces to be welded. It is weighted at the bottom to prevent flapping and clears the floor by about one inch, allowing air to circulate freely and carry off fumes and heat.

The cloth is noncombustible and has high tear strength. It is, in addition, moisture proof, mildew resistant, clean-

Photo: Owens-Corning Fiberglas Corp.

One corner of Tube Turns, Inc.'s new welding booth. Note weights sewed into fabric at bottom to prevent flapping

able, colorfast and durable, doesn't stretch or shrink, and because of its inorganic composition, will not rot or decay. It is resistant to most acids and alkalies.

Advantages of Tube Turns' new booth are: Low cost, compared with metal enclosures of the same size; quick access from any angle; ability to receive large size work without difficulty; portability, and more comfort for the welder.

Work Holding Device Adaptable To Many Jobs

Contributed by
Texas Engrg. & Mfg. Co.

A SIMPLE FIXTURE, requiring less than four hours to build, has reduced tear-down and build-up time on hydraulic cylinders by 50 per cent in our hydraulic shop at Dallas, Texas.

The fixture, which is designed to handle C-54 nose gear retract cylinders and two different types of C-54 wing flap cylinders, consists of three basic parts—a base plate which is attached permanently to the work bench; a pin and bracket assembly for holding the fitting at the end of the cylinder, and a leather-padded throw-over clamp to grip the cylinder.

The pin and bracket assembly is attached to the base plate with two large set screws, so that it can quickly be moved to any one of three positions to accommodate the three different length cylinders the fixture is designed to handle.

Not only has the new fixture reduced overhaul time by 50 per cent, but in addition it has completely eliminated the danger of scarring the cylinders which was always present when the cylinders were clamped in a vise.

We have developed a similar fixture for C-54 main gear cylinders, and others are in the process of development to handle the hydraulic equipment on F-47s, AT-6s, B-25s and other aircraft which is being rehabilitated for various foreign governments.

Donald White, hydraulic mechanic, disassembles a hydraulic cylinder used to operate the wing flaps of a transport plane. The same principle may be employed in making holders for various types of jobs

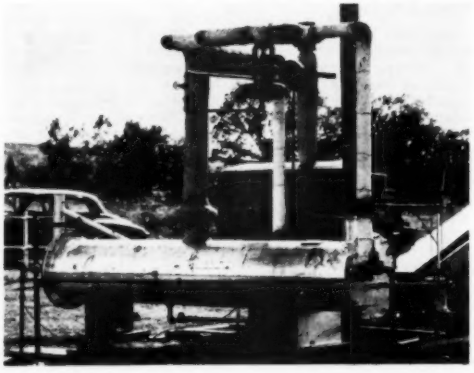
Crude Oil Vaporized for Gas Engines

Contributed by
Black, Sivalls & Bryson

RECENTLY WE installed what is actually a miniature topping plant to provide fuel for a gas engine at a point where natural gas was becoming scarce. The unit is a simplified and compact fuel vaporizer — actually a self-contained power source.

Operation is accomplished by utilizing exhaust heat from the engine, usually wasted, to heat the crude oil sufficiently to vaporize the lighter hydrocarbons—propane, benzine, naphtha and gasoline. These lighter hydrocarbons are then passed to the engine as fuel in vapor form.

Data on operation shows a considerable saving in fuel expense after the installation of the vaporizer. This installation, at Guernsey, Wyoming, showed a drop in fuel consumption from $430 per month to $240 per month.



An installation of the crude oil vaporizer is shown driving a Waukesha engine

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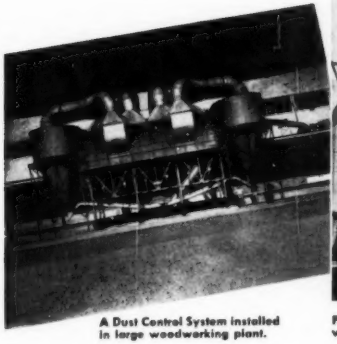

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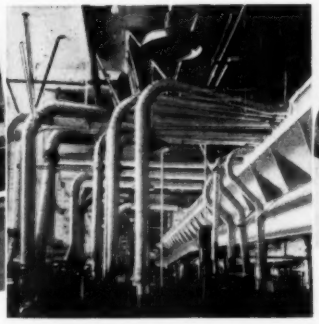

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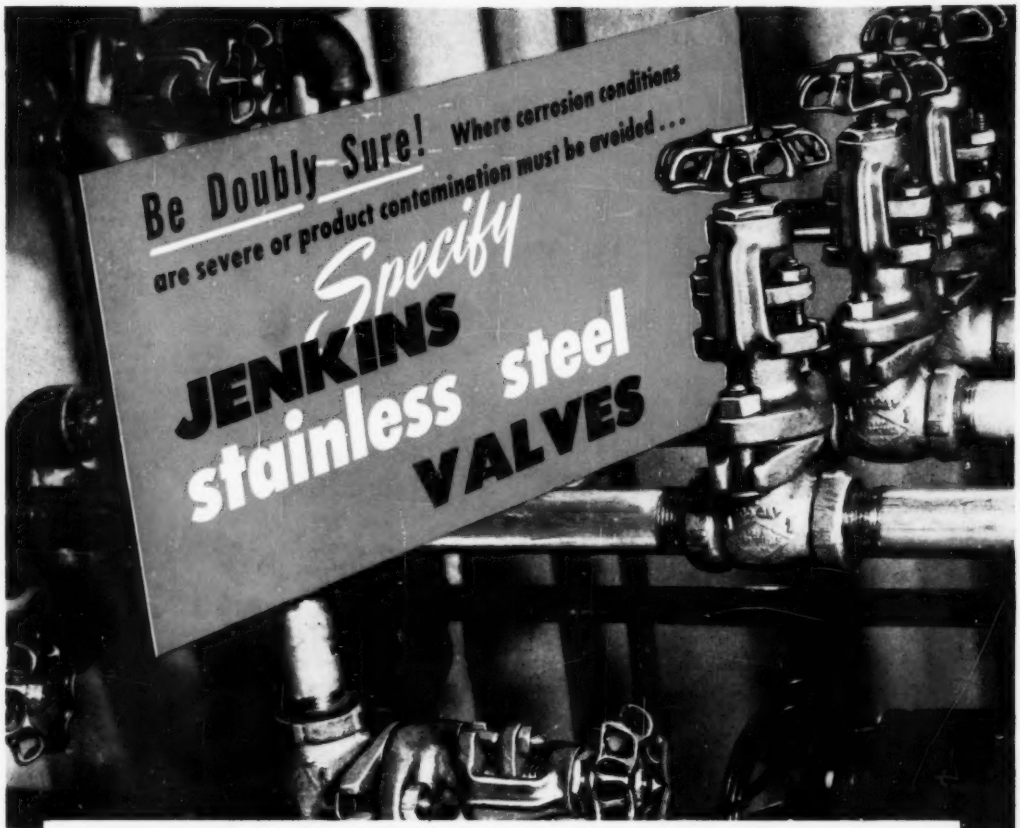

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